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GAS JOURNAL

LIGHT ✦ HEAT ✦ POWER ✦ BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

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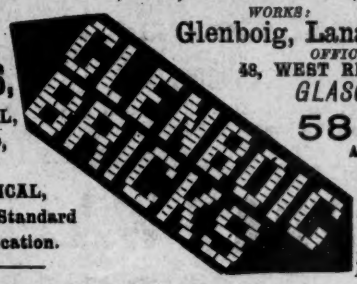

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VOL. CLXIV., No. 3162.] WEDNESDAY, DECEMBER 19, 1923. [75TH YEAR.

EDITORIAL NOTES.

Gas at the British Empire Exhibition.

PARTICULARS of the scheme for a co-operative gas exhibit at Wembley next year—of which a general account has already appeared in the "JOURNAL"—were issued last week from the offices of the British Empire Gas Exhibit Committee, No. 28, Grosvenor Gardens, S.W. 1, to all the principal gas undertakings of the British Islands; and they will shortly reach every undertaking in the Empire. Those particulars are accompanied by a letter asking for the whole-hearted financial support of every undertaking for this important co-operative enterprise by the gas industry. The letter bears the signatures of the Presidents of the National Gas Council (Mr. D. Milne Watson), the Gas Companies' Protection Association (Dr. Chas. Carpenter), the British Commercial Gas Association (Mr. H. Wade Deacon), the Institution of Gas Engineers (Mr. Samuel Tagg), and the Society of British Gas Industries (Lord Weir).

Never has a more authoritative and completely representative appeal for united action for the common good been made to the industry. Never was the occasion more appropriate or the opportunity more critical. Never, we believe, will there have been a more prompt and full response than that which will come to the appeal. For the first of these confident assertions, the names attached to the letter are sufficient warrant. For the second, the particulars sent to the chairman of every undertaking, and the further information furnished to the chief officers, provide ample proof. For the last, an accompanying "first list" of subscriptions already promised by some fifty undertakings (which received early information about the scheme through being represented on certain committees) affords assurance. To have secured promises amounting to nearly £50,000 before issuing the appeal generally, is a result on which the Executive Committee and the industry are alike to be congratulated. It promises well, not merely for the success of this particular enterprise, but for the future of the industry as a whole. It will, we hope, more firmly than ever establish the steadily growing habit of combining forces, financial as well as intellectual, for common ends—a habit which began in faith, has developed in most gratifying manner as a result of experience, and continues to grow in the fertile soil of confidence begotten of experience.

In some parts of the country it may be said: "Times are hard; trade is depressed. Can we afford to contribute our share of this proposed expenditure?" To this we would reply: First, that hard times call for more, not less, effort to maintain and develop business; secondly, that the gas industry cannot afford not to take full advantage of next year's opportunity; thirdly and consequently, that no individual undertaking in the industry can afford not to contribute its proportionate share of the cost of that from which it will proportionately benefit. No one, be it added, looks for immediate, local, or at any time directly traceable, results from the British Empire Gas Exhibit in the least commensurate with its cost. The direct results will undoubtedly be considerable. But it is the general world-wide effect upon the gas industry, as an industry, of whether or not it is worthily represented at Wembley, and adequately advertised to the Nation and the Empire, that far-seeing gas administrators will weigh and consider when the Committee's appeal is before them—as it has been weighed and considered by those who have signed the appeal and those who have already endorsed it with £50,000 sterling. In coming to their unanimous decision, those signatories and supporters have been influenced not a little—as, indeed, we believe their colleagues throughout the industry will be influenced—by the wonderful stimulus to its business that ensued from the co-operative campaign which had been fully launched when the National Gas Exhibition was held in 1913, which was carried on educationally throughout the war, and has since been growing both in intensity and effect. Wembley will provide a great opportunity for giving that campaign added impetus. To have missed the opportunity would have been to do the industry incalculable harm. There is ample assurance now that it will not be missed; but, to ensure that it shall be utilized to the full, it is imperative that every undertaking in the country should respond fully to the call to service which is now before them. We have every confidence that they will; and we hope they will do so promptly, and so facilitate the task of those who are shouldering with enthusiasm the burden of arranging and executing all the details involved in bringing such a scheme to fruition. It is a service rendered by the few, without fee and reward other than the confidence and support of the many who have now the opportunity of demonstrating the one by the giving of the other.

Revision of Therm Standard Prices.

IT may be expected that from now onwards there will be several applications to the Board of Trade for the revision of standard prices that were fixed when the costs of gas production and supply were higher than they are at the present time; and therefore the recent inquiry into the reduction of the standard price per therm of the Gas Light and Coke Company will be of considerable service to those undertakings which are the subjects of an application for revision, either at their own instance or at that of the local authority or other body of competent persons. But it must not be taken that in all cases the Board will hold an inquiry, or will make an amending Order merely because an application is made. Applicants have the obligation upon them to show to the satisfaction of the Board that costs have been substantially reduced, owing to circumstances beyond the control of the company concerned. Unless this can be done, the Board will have no reason to move in the matter. This is a point that should be emphasized, as on every occasion which some local authorities might regard as a suitable opportunity for trying to prevent an increment of reward to the proprietors for the good and competent management of the undertaking, they might attempt to utilize these revisory powers to that end. If they succeeded in this, the intended inducements of the sliding-scale to good management, and through it public advantage, would be largely nullified. Hence the discretion reposing in the Board of Trade. There must be discrimination, too, by applicants between those costs which are not under the control of the directors of a company and those which are. This shows that intending applicants, not being the company concerned (as in the case of the Brighton and Hove Company, who are themselves making application for a reduction), must fully assure themselves that they have good ground on which to approach the Board. In this regard, they will obtain a considerable amount of guidance by studying the article by Mr. George Evetts, M.Inst.C.E., which appeared in the "JOURNAL"

last week, and which presents in clear and edifying manner the lessons of the proceedings before the Director of Gas Administration (Mr. H. C. Honey) in respect of the application of the London County Council for the revision of the standard price of the Gas Light and Coke Company.

So much as to the obligation there is upon a local authority proposing to make application for an amending Order being assured of their ground, and exercising a wise discrimination as to the causes of the reduction of costs. There is also an obligation upon the company concerned to make a frank and detailed statement, exhibiting precisely the current position of that part of the costs of production and supply due to circumstances beyond the control of the directors—such as costs of materials, labour, local rates, &c. The Board of Trade have already the data as to costs before the war and at the time the original standard price per therm was determined under section 1 of the Gas Regulation Act. Full disclosure bearing upon the suggested amendment is desirable. Then if both parties are wisely and competently guided, it will most certainly be found, as was the case in the application of the London County Council in respect of the Gas Light and Coke Company's standard price, that the difference between applicants and the gas undertaking as to the amount by which the standard price should be reduced is a very narrow one—particularly if consideration is given to the part of the reduction of costs due to good management, which, always essential in a public utility undertaking, is more so with the costs of raw materials, labour, rates, &c., heavier than the normal of pre-war days.

We do not intend to traverse the article by Mr. Evetts. The lessons he has there mirrored from the proceedings of the inquiry into the revision of the Gas Light and Coke Company's standard, will be valuable to all undertakings the elements of whose standard price is placed under similar scrutiny, with a view to its reduction. But we have referred in general terms to the preliminary obligations of the applicants for revision, and those of the directors of a company who are concerned in doing all possible to ensure that justice is done to the stockholders. At the other end is the decision of the Board of Trade as to the amount by which the standard price should be reduced. The duty is one of highly judicial importance, and therefore exacting. In passing, it may be said that it is remarkable, with the large number of determinations the Board have been called upon to make in the matter of fixing standard prices under section 1 of the Gas Regulation Act, how small—if any—has been the discontent of those concerned in the matter, considering particularly the circumstances of the time at which decision had to be made. And what has been true in the past will be true now in connection with the revision of standard prices. But the greatest difficulty that will weigh upon the Director of Gas Administration in making his recommendation as to the amount of reduction of a standard price will be accurately to measure the allowance for the part of the reduction of costs due to circumstances within the control of the direction of the company. The question of dividend does not come within his purview; but the effect of the decision upon the lividend may be very considerable. It is not the business of the Board to make a decision which will have the effect of bringing down the dividend approximately to that of pre-war times. That has nothing whatever to do with the Board. Best part of a decade has passed since 1914; and a decade is a long time in the life and activities of an industry. During that period, much may have happened which, apart from the costs over which the directors have no control, may have enabled astute management to lower the expenses of production and supply, to the advantage of the consumers and, the sliding-scale claims, to that of the proprietors. Did the Board ignore the effects of good management, a grievous injustice would be done to gas proprietors, which would, we are confident, be the last thing to which the Board would consciously be parties. How badly the want of consideration of the influence of the factor of good management would injure proprietors is shown by the apt illustration of Hornsey to which Mr. Evetts refers in his article.

The Gas Regulation Act, however, recognizes that the Board cannot claim in such a matter as this an absolute infallibility; and therefore it provides that notice shall be given by the Board as to the revised standard price that it is proposed to authorize, which notice also invites any person desiring to make representation with regard to the matter to do so, within a given period, by letter addressed to the Director of Gas Administration. This indicates that it must not be taken, when the notice has been given, that the revised standard price proposed in it is irrevocable. If it were, there would be no need to invite representations concerning it, should anyone have anything to submit. Such a notice has been given in the case of the Gas Light and Coke Company; and if there are any representations to be made respecting the proposed standard price, they must be addressed to the Board not later than Friday of this week [*ante* p. 722]. The revised standard price is 11d. per therm—a reduction of 4·2d. When the inquiry was held, both the County Council and the Company submitted figures which, in their opinion, should constitute the new standard price. We will not discuss, while the proposed standard price is still subject to amendment (if the Board are satisfied by submissions that it should be amended) whether or not in the 11d. there has been sufficient recognition of the effects of good management and efficiency in reducing the costs of production and supply. If there has been, well and good. If there has not been, then justice has not been done to the proprietors, and the fundamental principles of the sliding-scale have been assailed. Mr. Evetts in his article points out clearly the contentions of the County Council and of the Company. The former considered that the new standard price should be 10·8d. per therm. The Company, on the other hand, stated that the present cost of gas had increased by 3·4d. per therm since June, 1914; and, consequently, the original 3s. 2d. per 1000 c.ft. (7·6d. per therm) should now become 11d.—an allowance making up the figure to 11·4d, being the result of the economies effected. Thus, in their opinion, the reduction of the standard price of 15·2d. per therm should be by 3·8d. taking the economies into account. According to the Company's calculations, therefore, the Board of Trade have not in the proposed new standard of 11d. allowed anything for good management and efficiency in working, which is far more difficult in the circumstances of to-day than in pre-war days. According to the London County Council figure of 10·8d., only 0·2d. has been allowed for the effects upon costs of good management and efficiency. Thus we are still in the dark as to whether the Board intend to recognize the impressions upon costs of ability and skill in management, which produce economies and efficiencies beyond those yielded by favourable market changes.

Critical Days.

THE whole country sincerely hopes that there will be no fresh rupture between the coalowners and the miners sufficient again to cause a stoppage of output. We are optimistic enough to believe that nothing of the kind will happen, for the simple reason that the coal industry cannot afford a stoppage, nor can the Miners' Federation and the associated Unions in the bad financial circumstances in which they still are through the exhaustion and indebtedness to which they committed themselves in their previous essay to impose their will upon the country, which had such disastrous consequences not only for the nation but for the miners themselves. The lessons of that stoppage have had a salutary effect in the negotiations which have been proceeding for some time regarding the miners' claim for an amendment of the existing agreement, under which a minimum wage is guaranteed, with a sharing of surplus profits in defined percentages. The miners are now asking for a 20 p.ct. increase of the standard wage, and a revision, in their favour, of the percentages into which the surplus profits are divisible. The representatives of the coal owners have intimated their willingness to make recommendations regarding a modification of the percentages; but they are not disposed to consent to the increase of 20 p.ct. in the minimum wage. The price of coal to-day is still too high; and the 20 p.ct. increase of the minimum wage would advance the costs of production, inflict a serious blow on the domestic consumer, injure industries dependent on coal, and cripple the export trade. Even with present British prices, the American coal industry is not neglecting competition in the European markets, and not without success in certain instances, although confessedly we are doing very well, as the Board of Trade statistics show month by month.

But it is upon the point as to the increase of the minimum wage that the parties have failed to reach a basis of settlement. Towards the end of last week, the report was made that there had been practically a breakdown in the negotiations between the Sub-Committee of the Mining Association

and the Executive of the Miners' Federation. From the conferences between the two parties, the scene shifted to a delegate conference of the miners, at which a recommendation was made and adopted that a ballot of the men should be taken as to giving three months' notice to terminate the agreement; the men being advised to vote in favour. We do not like the look of this; it has the appearance of the revival of the dominating influence of the extremists in the counsels of the Federation, with all their passionate bombast and threats, instead of that steady diplomatic commonsense attitude which gains the greatest ends. A more favourable sign is that there was a sharp division of opinion as to advice being given to the men to vote for the termination of the agreement; but on the other hand, again, there were among the delegates those who wished that notice of termination should be given without reference to the men. There has already been a ruling that, in a matter of this kind, the men should be consulted, though it is not a free and independent ballot which is launched with a suggestion from headquarters as to which way they should vote. At any rate, it puts the brake on the exercise of free will. If the ballot decides to give three months' notice, this at all events will see us through the worst part of the winter; and three months is a good period in which to search for an avenue by which an amicable settlement can be reached. But amicable settlements are not achieved by exhibitions of passion, arrogance, or obstinacy, which are characteristic of some of the representatives of the miners—fortunately not of them all. Justice and fairness are matters which should not be claimed by, or be applied to, one side only. They must be applied to both; and the interests of the third party—the consumer—should not go unheeded. That, where coal is concerned, voiceless individual invariably comes off worst of all. However, unsettled as things are in respect of the present particular issue between owners and miners, the time for serious anxiety is not yet.

Cost of Pipe Alterations for Road Diversions.

It looks as though the gas industry is coming seriously to grips with the question of the payment of the costs incurred in removing and re-laying gas-mains necessitated by the diversion of public highways. The matter was lately raised during the inquiry into the Special Order promoted by the Brentford Gas Company. The contention of the gas industry is that any costs involved in making changes in the location of gas-mains should be a charge upon the work of road diversion. The gas industry has statutory rights in this regard; and it does not intend to allow any infraction of them. It is learned from the minutes of the Central Executive Board of the National Gas Council that the London County Council, in relation to the contemplated diversion of certain highways, had requested a Gas Company to remove their mains, and relay them in another position. The Company have declined to bear the expense of doing this. The County Council, however, appear to be bent upon stirring up an agitation over the question; but we are hoping that any contemplated injustice will meet its deserts. Of course, the Council will say that it is not an injustice, and that whatever statutory rights the gas industry may possess in this regard should be abrogated. The industry takes the contrary view. The Council are inviting the views on the subject of Metropolitan Boroughs and road authorities throughout the country. We can well imagine the County Council will get precisely the type of opinion that they require. In order to help to direct views into the desired mould, they have suggested to those to whom they have sent their invitation that, inasmuch as private statutory companies have the right to use public streets without charge for the purpose of accommodating their pipes and wires, such right should not involve an obligation upon the local authorities to keep the streets unaltered; and if such streets are diverted and altered, the local authorities concerned should not be called upon to bear the cost of the necessary removal and relaying of the pipes or wires. The Council apparently ignore the fact that they are dealing with public services, operated under statutory powers. They also overlook the fact that when gas or electricity supply companies have occasion to break open the roadways to get at their pipes or cables, they have to pay for the reinstatement of the roads—and pretty heavily in these times. But when the road authority seeks to alter a road and require for their purposes to change the location of the gas-pipes, then they consider that the latter part of the work should be a charge on the gas suppliers. The equity of this cannot be discovered, however scrupulous the care with which we search for it. As already indicated, the proposal of the London County Council is altogether repugnant to the statutory rights of gas undertakings. This being so, the Central Executive Board of the National Gas Council are of opinion that the industry must resist, with the utmost vigour, any action which in this regard may be instituted by the London County Council or other road authorities. Steps have been taken to keep a close watch upon this movement, and to deal with any situation which may arise that is hostile to the rights and interests of the industry; and this action will, we are sure, be universally endorsed by the administrators of gas undertakings.

Unemployment Relief Gas Schemes.

We have not yet heard that the objections have been met which were raised on behalf of gas company undertakings to the terms regarding State assistance to enable the carrying out of schemes for assisting employment by public utility undertakings run by private enterprise. Nevertheless, some substantial progress is being made with the approval of schemes, though these very largely represent initiative in this matter by local authorities. Some measure of the acceleration there has been in the promotion of schemes is shown by the fact that, during the past twelve weeks, approval has been given to schemes of an approximate total value of £10,000,000; and projects continue to be submitted at the rate of twenty to forty a day. Since September, 765 schemes of 262 local authorities have been approved; making the total in three years since the Unemployment Grants Committee was formed 6200 out of 9500 considered. Works of a total value of £40,000,000 have been sanctioned. It is seen from an analysis of the projects approved during the eleven weeks ending Dec. 6 that the aggregate estimated costs respectively of the non-revenue producing and revenue-producing schemes are running almost neck to neck. During those weeks the non-revenue producing ones involved an estimated aggregate cost of £4,017,175, and the revenue-producing ones, £3,989,625. Of this latter sum, gas only figures for £220,643, while electricity stands for £656,100. These are not remarkable figures—particularly for electricity, bearing in mind the feverish anxiety displayed in some quarters for utilizing this opportunity for getting cables extended and public lamps converted. As to gas, there has been hesitancy in making application, owing to the conditions and their effect upon the statutory rights of the companies. Probably, if there was a favourable pronouncement solving the difficulties, the formulation of schemes would proceed at faster pace. The disadvantages under which public utility companies compared with local authorities labour in this matter is seen by the fact that the approved total of their schemes represents no more than £1,500,000 in value. We admit that the offer of State assistance to public utility companies, with the view of inducing the carrying-out of schemes giving employment, is comparatively new, and there has not been much time to look round, and consider well probable requirements and future developments. This is one of the troubles with an industry developing technically and commercially as is the gas industry. It is, for instance, very difficult, so far as manufacturing plant is concerned, to commit an undertaking years ahead of requirement, in view of technical developments; but, in respect of distribution systems, there is much work that could be done, particularly having regard to the pressure requirements of the Gas Regulation Act, and the plans of progressive managements for carrying supplies to outside districts where the blessings of a gas-supply have not hitherto been realized. However, the authorities recognize that the assistance to public utility concerns is a fairly new addition to the national relief policy; and they are hoping that, when the possibilities of the State offer become better known, more advantage will be taken of them.

Labour and the National Interests.

In some parts of the labour world, it is clear, no consideration whatever is given, in the forming of policy, to the question of what is best in the national interests. Where ultraistic ideas flourish, sight appears to be lost of the fact that labour is not something apart; that its interests are as inseparably bound up with those of the nation as are those of any other section of the body politic. Very much has

recently been said as to what labour would do if ever it gets into workable power, and holds in its hand the reins of government. Those who are at the head of the Party are not so mentally obtuse as to believe that they could carry out their schemes unless they have behind them an absolute majority over the other parties combined; and so it is that during the past week there have been afloat a good many hints as to what would be the modified programme of a Labour Government if it got into power temporarily. Two things it would not attempt. It would not proceed with the Capital Levy and Nationalization until after another General Election, when it is hoped by the Labour Party that the country would entrust them with sufficient power to carry through their extreme proposals, and begin the work of wrecking those things which are essential to national stability. That work would render the position of labour worse than it is to-day, or has been at any time since the war. Yet, as Lord Inchcape was saying the other day, when presiding at a Company meeting, "no section of the community has more interest in the welfare and stability of the country than the great body of weekly wage-earners." That is true; but some people are mentally blind.

Many other wise things were uttered by his Lordship in the same speech, which should make the leaders of labour pause and think. But we are afraid all words of wisdom which do not square with their policy will be as the seed which fell upon stony ground. Said Lord Inchcape deliberately—unless our people are prepared to work hard and willingly, and thus help to reduce the cost of production, we shall be unable to regain that position in the markets of the world which we previously held. From deliberate utterance, he passed into advisory vein. In his view, there is a possible remedy for unemployment; and this remedy, in his judgment, is in the hands of the trade unions. If they would only stand aside with their rules and regulations as to minimum rates of wages, restricted hours of labour, and limited output, and give economic conditions free play for a year or two, he believes the costs of production would come down, and world markets would be found for an increased output of our manufactured goods. In short, it is consummate folly to keep up nominal wages, shorten hours, and restrict production, when to do so costs fifty millions a year in the shape of a dole to a million idle people. The way to fuller employment and prosperity is by reducing production costs and finding world markets for our manufactures. But it will take the labour leaders some time to grasp these elementary truths, for the simple reason that they do not harmonize with adopted policies, or with rules and regulations which they regard as more sacrosanct than those Constitutional rules and regulations which govern the whole community.

Gas-Works Rating Assessments.

Undertakings supplying a commodity which is almost universally required by the public cannot afford to neglect any and every means of working as economically as possible, consistent with efficiency. There is one direction in which the greater the economy that can be effected, the greater the proof of the efficiency of the administration; and that is in respect of the rating assessment. It is to be feared that there are gas directorates and committees who do not look into this matter with sufficient care, and whose assessments could by the aid of expert examination be considerably reduced, and so produce a saving per annum well worth having. A paragraph in a later column shows that one gas undertaking has secured a reduction of 60 p.ct. in its total assessments, and another 25 p.ct. These are figures which may cause other gas managements to ask themselves whether their assessments are resting at the irreducible level.

Reduction of Contribution to the Gas Fund.

By clause 7 of the Gas Regulation Act, provision is made for the salaries, remuneration, pensions, and gratuities of the Chief Gas Examiner and the Gas Referees and their assistants being paid out of a gas fund. Sub-section 3 of clause 7 enacts that "any undertakers with respect to whom an Order under this Act has been made shall, on or before the first day of April in each year, pay to a fund (to be called the gas fund) a contribution not being at the rate of more than 3s. for each million cubic feet of gas sold by them in the preceding year, and the Treasury may determine that that fund shall be a public fund within the meaning of the Superannuation Act, 1892." The Board of Trade have power to prescribe the rate of contribution each year. Hitherto the rate has been the maximum; but we learn from the minutes of the Central Executive Board of the National Gas Council that the Board have notified a reduction, as from Jan. 1 next, to 2s. per million cubic feet sold in the current year.

Coke for Export and at Home.

A correspondent of the "Yorkshire Post" complains that coke is being sent abroad from the Leeds Gas-Works, and that home consumers suffer in consequence. He asks for more considerate and equitable treatment for the ratepayers who send their own vehicles for the fuel. We have no doubt the Leeds Corporation Gas Committee could make a very good reply to the complaint; and perhaps things are not so bad as the correspondent paints them, when he says that "manufacturers, schools, hospitals, traders, and others, down to golf club houses, are left without." Anyway, it was not always the case that gas coke was so much sought after. To-day, there is an actual shortage in many places. Leeds is to be congratulated upon the popularity of its coke.

The Flat Rate for Coal and Coke.

The Railway Rates Tribunal have given their decision upon the application of the Monmouthshire and South Wales Coal Owners' Association and other bodies for the removal of the flat rate of 2d. per ton on coal, coke, and patent fuel, and of 4d. per ton on pitwood, charged by the Great Western Railway Company. The tribunal state that they are unable to remove the flat rate on the grounds presented by the applicants, or to assume that the Minister of Transport was wrong when he directed that the flat rate should be charged.

Crippled Wagons.

A matter of importance to gas undertakings which own railway wagons has been communicated to us by the Standing Joint Committee representing various coal associations. It is to the effect that the Railway Companies' General Managers have agreed, as an experiment for twelve months from Jan. 1 next, to adopt a commuted annual charge of 1s. per wagon, in lieu of the present charges for shunting and siding rent on private owners' wagons stopped for repairs. The form of agreement to be entered into by the wagon owners with the railway companies is now being finally settled, and a print of the agreement will be sent to all wagon owners assenting in the course of a few days.

Borneo Petrol and Benzole.

A statement has been circulated as to the "supremacy" of "Shell" motor spirit over benzole. The claim is said to be due to the proportion of Borneo petrol that the spirit contains. It is further stated that the aromatic hydrocarbons of this petrol are "similar in molecular structure to the finest benzole, but, happily, free from the deleterious and corrosive substances which accompany benzole produced from coal." The Managing-Director of the National Benzole Company (Mr. A. J. Tibbitt) has at once challenged and disproved the statement so far as the "deleterious and corrosive substances" are concerned. As he says, it is not correct to imply that refined or purified benzole obtained from the destructive distillation of coal contains any of these deleterious and corrosive substances—for the fact is exactly the opposite. The purity of Borneo spirit, as of benzole, depends entirely on the efficiency of the refining process; and National benzole is refined in every case to comply with the strict formula of the British Engineering Standards Association, which standard was purposely framed to eliminate all deleterious substances.

The Sugar Beet Industry.

Sulphate of ammonia makers would like to see a greater development of the sugar beet industry in England. There are prospects that they will do so. A new factory is being erected at Southwold Harbour, which is expected to produce about 8000 tons of sugar a year; and it is hoped that it will be finished in time for next season. The Syndicate who have the matter in hand have acquired the harbour, while a circular railway about 45 miles in length, and embracing about 200,000 acres, is in contemplation for the transport of beet. Lord Huntingfield, M.P., states that there is room for about 170 sugar beet factories in this country.

PERSONAL.

At Birmingham last Wednesday, a smoking concert was held under the Chairmanship of Mr. J. Dingley, Assistant Secretary to the Gas Department, and presentations were made to Mr. W. LYCETT and Mr. F. R. AYRE. Mr. Lycett was asked to accept from his colleagues an oil painting, a gold watch, and a framed photograph. He was one of the oldest and best known members of the outdoor staff of the gas department, and had been a District Inspector since 1894. A bureau bookcase was given to Mr. F. R. Ayre, and a silver dressing-table set to Mrs. Ayre. Mr. Ayre has been on the Commercial Staff of the department, and is now leaving to take up a position with the Parkinson Stove Company.

At Penrith, Mr. EDMUND SHAUL (the Gas Engineer and Manager) has recently completed fifty years' service, and Mr. GEORGE WAINWRIGHT (the Town Clerk) forty years'; and these interesting events have received gratifying recognition. The two gentlemen were the principal guests at a dinner at the Crown Hotel last Thursday, when over fifty representatives of the public life of the town assembled to do them honour; and advantage was taken of the opportunity to present to Mr. Shaul a handsome bureau with bookcase above, to Mr. Wainwright a gold watch and bureau, and to Mrs. Wainwright a gold and jewelled pendant and chain. Mr. Shaul has been Gas Manager for over forty years, succeeding his father, who occupied the same position for thirty years. Earlier in the week, at a meeting of the gas-works staff, presided over by Mr. J. Corrigan (Assistant Manager), Mr. Shaul was presented by the employees with a silver cigarette case and an illuminated address.

Mr. F. J. BANCROFT, B.Sc., M.Inst.C.E., M.Inst.M.E., on Monday of this week definitely decided to retire at the end of March next from the position of Engineer and Manager to the Barnet District Gas and Water Company—a position which he has held with conspicuous credit to himself, with much satisfaction to the Board of Directors, and with very substantial benefit to the undertaking, for the past fifteen years. When leaving to enjoy a life of greater leisure, he will take with him the best of wishes of the Directors and the whole of the staff, with whom he has worked so long and so well. Mr. Bancroft first joined the Company in 1886, but ten years later left to go to Hull, as Gas and Water Engineer. On his appointment there, the Corporation bought up the Kingston-upon-Hull Gas Company, and he managed their works, just behind the Town Hall, for two years. At the end of this time, the works were demolished, and the Corporation took a supply in bulk from the British Gas Light Company. In 1908, Mr. Bancroft resigned to become Engineer at Barnet. In addition to his work there, he is a Director of the Woking District Gas Company and of the Woking Water and Gas Company. As successor to him at Barnet there has been appointed Mr. J. HASLEDINE, who is at present with the firm of Messrs. Taylor and Sons, consulting engineers, of No. 36, Victoria Street, S.W.

OBITUARY.

We regret to learn of the death on the 3rd inst., after an operation, of Mr. EDWARD JONES, the Manager of the Lewes Gas Company. He had been with the Company for many years, and in 1908 succeeded Mr. Levi Monk as Manager.

The death is announced, as having taken place suddenly in Melbourne on Monday (while responding to a toast at a banquet) of the Hon. Sir John W. TAVERNER, K.C.M.G. Deceased, who was 69 years of age, was one of the Directors in Australia of the Colonial Gas Association, Ltd. He will be remembered by shareholders who have been in the habit of attending the meetings as a former member of the Board in London.

We regret to record the death, after a long illness, of Mr. THOMAS WILLIAM ANDREWS, of Romilly Road, Cardiff. Deceased, who was in his 62nd year, entered the employ of the Cardiff Gas Light and Coke Company in 1875, and was for many years Chief Accounts Collector. He served on the Company's Co-partnership and Superannuation Fund Committees. The funeral took place last Friday, when there was a representative gathering, including Mr. George Clarry, F.C.I.S., General Manager and Secretary of the Company. At a presentation made to Mr Andrews some time ago, Mr. Clarry bore testimony to his "earnest and devoted attention to duty, perseverance and conscientiousness, and uprightness of character." It is interesting to record that Mr. Andrews' brother, who is a lamp inspector, has been with the Cardiff Gas Company for 50 years, and his nephew, who is control clerk, 18 years, while his father had served 46 years with the Company.

Institution of Public Lighting Engineers and Superintendents.—At a meeting of the Executive Committee on the 14th inst., it was decided to hold the first general meeting of the Institution in London in the latter part of January or early in February. A paper is to be read by Mr. S. B. Langlands (the President). Further particulars will be given, and applications for membership will be received, by Mr. W. J. Liberty, Corporation of London, Guildhall, E.C. 2.

ELECTRICITY SUPPLY MEMORANDA.

CREDIT must be given where credit is due. A large amount of enterprise is being evidenced by the British Electrical and Allied Manufacturers' Association in the section of the British Empire Exhibition which they are to occupy. The area of their exhibit is 3½ acres in the Palace of Engineering; and on such a site much can be done. Everything is being carried out on the working scale. There will be a completely equipped boiler-house, and a power station of 6000 H.P., together with a sub-station. Present ideas of a power station would describe this one as small; but it will exemplify the much larger scale operations of a super-power station. In the boiler-house, there will be mechanical handling of material; and weighing and measuring instruments will show the amount of coal that is being used, the temperatures at different parts of the boiler plant, and the quantity of steam supplied to the power-house. In the latter, three steam-turbines, with direct-coupled generators, will be installed; and below will be the condensers. Switchboards, sub-stations, and transformer stations are being constructed in various parts of the exhibition grounds. One sub-station will convert alternating current to direct current, largely for use in the Amusement Park. In the Palace of Engineering, there will also be examples of slow-speed engines delivering power to the switchboard, as well as oil and gas engines. Arrangements have been made by which the public will be able to inspect the details of the plant, and of electric appliances required for trains and tramways, and factory use. Exhibits of railway motors and control gear and of railway coaches electrically equipped will be there. Industrial applications of electricity will be demonstrated not only in this section, but also in the Mechanical and Shipbuilding Section on the south side of the Palace of Engineering, which is being organized by the British Engineers' Association. In addition, there will be the section promoted by the Electrical Development Association. This will be in the north-west corner of the Palace of Engineering, and will occupy 10,000 sq. ft. Here will be witnessed the applications of electricity to lighting, heating, cooking, cleaning, &c. The exhibits will comprise individual items which will enable the visitor to examine the wide choice of designs available for each purpose. It is stated that "the section will be laid out from the point of view of comfort, and will be an undoubted attraction to women visitors." There will no doubt be much of interest here; there will also be a great deal which will not be seen, or about which much will not be heard, regarding electrical operation, but which would deeply interest the public. In an Exhibition official note, we see the Association is described as the "nerve centre" of the electrical industry; and it is stated that at the exhibition it will serve the public in many ways. "It will be an advisory agent; an information bureau; a demonstration of system; an education in method; a solver of difficulties; and will form a meeting-place for conferences." If they go on like this, there will soon be a short-circuit, or some other uncomfortable electrical mishap.

Preparing for Wembley.

Street Lighting and the Unemployment Plea.

There are wise men in Elland; there are others who would involve the town in an unnecessary expenditure upon something which would not be an improvement, but a means of securing a little additional revenue for the Electricity Department. The latter have adopted all the wiles of modern invention for getting the whole of the street lighting in the hands of the Electricity Department. The District Council have an Electricity Committee and a Lighting Committee; and they are prudent in this. The street lighting should be dealt with as a subject of administration quite apart from the fact that the Council control a trading department. The Electricity Committee put forward a scheme for the conversion of the gas-lamps (there are 249 of them, and 197 electric lamps) to electricity; and their main plausible reason for doing this was unemployment. Local authority electricity departments are vigorously beating the drum of unemployment in their desire to get hold of the street lighting, and to extend their cables through streets not yet supplied with current. But it is bad policy to assist unemployment by doing work which is not beneficial. It is indeed fortunate for Elland that the Council have a Lighting Committee who are not disposed to have their functions usurped by the Electricity Committee, and who are able to examine the lighting position and new projects from an entirely independent and impartial standpoint. They have investigated the scheme of conversion; and they cannot see that by it the town is to gain in economy or higher efficiency. In our opinion, the figures show that they are right, and that the Council have done the correct thing in referring back the scheme. The Electricity Committee will probably meet the Council again, and make an effort to get one section of the project through.

An Examination of the Figures.

The reports and correspondence that have appeared in the "Halifax Courier" enable an examination (though not so complete as could be desired) to be made of the figures submitted for the scheme; and to the initiated in these

matters, the data alone afford abundant justification for the stand the Lighting Committee have made. The estimated cost of the scheme is £7500; and 18¼ miles of trenches and cable laying would be involved. The published figures are vague as to what the sum of £7500 comprises; and had the Council accepted them without further evidence, they would have done something administratively not creditable. We know well the considerable cost in these times of opening trenches and reinstating roads and footpaths (apart from cable laying), and all the outlay that electricity distribution involves. In a letter to our Halifax contemporary, Mr. J. Bridge, the Engineer and General Manager of the Elland-cum-Greetland Gas Company, comments on this point. Dividing the capital expenditure of £7500 by the number of yards in 18½ miles, it is seen that only 4s. 7·28d. is allowed per yard for the entire scheme. Says Mr. Bridge: "Anyone acquainted with the cost of digging trenches under flagged footpaths, properly reinstating same on completion of the work, will readily see that the figure is very much under-estimated. Labour charges would practically absorb the whole of the amount stated; then, in addition to this, there is the cost of the cable, laying same, making joints, wiring the positions to be converted, and provision of the necessary lamps and switchboard at the distributing station." Further it is suggested that the annual cost of the scheme would be £1490, with a reduction by £22 10s. a year of the rate of interest payable after the first year. The present cost of the lighting—gas and electric—is £1606 17s. 7d. per annum. Thus, on this basis (assuming, though one cannot off-hand accept, the accuracy of the estimates), the saving would be only £116 17s. 7d. on the present total payment. But in September last, we see from the letter by Mr. Bridge, the Gas Company made the Council a handsome offer, which, if the latter were desirous of putting additional revenue into the coffers of the Electricity Department, would have enabled them to do so. The Company's offer was to take over the lighting of all the 249 gas-lamps, supply gas and mantles, replace defective burners and lanterns, and maintain all in an efficient condition, and in addition switch on and off the electric lamps, for the sum of £3 per gas-lamp—each lamp burning 2180 hours. This would have meant a total of £747, and would have left £859 17s. 7d., which would have allowed a payment of £4 7s. 3d. per electric-lamp. This offer was not accepted. Yet if the Council had paid the Electricity Department £3 per electric lamp—the price for which the Gas Company were willing to take over and maintain the gas-lamps—the total lighting would have cost only £1338, or a saving upon the rejected new electricity project.

A Question of Efficiency.

As already pointed out, the published details affecting the new scheme are not sufficient for even one initiated in these matters to make an examination from which positive conclusions could be drawn. But they are sufficient for doing so generally. There is something (though not much) to go upon relating to lighting efficiency. The electricity scheme proposed 2100 hours' lighting per annum; and the consumption of electricity, it is stated, would have been 30,114 units, which averages 14·3 units per hour; the proposed charge being 1¾d. per unit. The total number of gas and electric lamps is now 446; and, averaging the 14·3 units per hour over these, it gives 32 watts per hour. We assume the gasfilled type of electric lamp would be used; and a fair average expenditure of current for this during working life is 0·75 watt per candle power. Thus the light per electric lamp would be only 40 c.p. Photometrical proof could be given of this with a consumption of 32 watts per hour. Really we can only conclude from this that the scheme erred on the side of cut figures, in order to show an economy over gas. We are not surprised that there were members of the Council who had their doubts as to whether the estimates were high enough, and as to whether the efficiency of the lighting would be up to the present level. One of the speakers at the Council meeting at which the matter was debated said the town was one of the best lighted in the country; and there were in the discussion evidences of a strong feeling that it would be folly for the Council to add to their present financial commitments, when there was no proof that the efficiency of the lighting was going to be improved. We think the calculation we have made shows this. The Elland Gas Company is a progressive concern; and we are fully persuaded that they would not be content with street lamps giving a bare 40 c.p., and gradually depreciating throughout their life. However, the Council have looked at the matter from all points of view; and the result, as previously mentioned, is that the majority cannot at present see in it the material gain which alone would justify its acceptance.

Economy as a Developer of Business.

There seems to be a world movement just now among electrical men to secure greater economy and efficiency in the use of light. This is going on despite the higher duty per unit of energy now obtainable from electric lamps; efficient use of such lamps produces further economy in various ways. Of course, the same thing applies to gas; but in the gas industry a similar movement to that which is proceeding in the electricity supply industry is not so marked as it is with the competitor. But the electricity industry apparently has been persuaded that efficient use which leads to economy is one of the finest developers of business that it can have. We believe in it very strongly. On various occasions lately we have drawn attention to the fact that there is in this direction great activity among electrical people in this country, and the work is going on especially among shopkeepers for lighting and among householders for cooking. We see that the same movement in respect of lighting is afoot in Canada. It is stated that an educational campaign is being conducted in the principal Canadian cities by Mr. Frank T. Groome, who is an illumination expert. Wisdom and economy in the use of light is his theme. Among the philosophic gems to which he has given utterance is that "next to the merchandize, the strongest selling force in the world is light." He asserts that tests taken by storekeepers have proved that better lighting increases the average sale of goods per customer by 29 p.ct. It is marvellous how this is gauged so finely; but as in Canada, so here—the electricians are confident as to the correctness of their percentages of gain to business. But Mr. Groome finds that there still exists a great deal of doubt as to what is and what is not good lighting. There is something suggestive in such a movement taking place in Canada, seeing that it is the second largest coal-owning nation, and has the greatest hydro-electric production per capita of any country in the world. Notwithstanding, it is thought worth while to educate the citizens in the "wise and economical" use of light. Of course, in this country education in the wise and economical use of light is badly wanted first among electricity suppliers and electrical contractors, inasmuch as between them they are largely responsible for the common ghastly misuse of electric light. The missionary enterprise that is being carried on by Mr. Groome in Canada seeks to save eyesight and reduce lighting bills. There is wisdom in this; and it is thought that public authorities and gas and electricity purveyors in this country might do worse than conduct a similar campaign.

"If" the Price were Lower.

"If only the price of electrical energy for heating were lower!" Almost a volume could be written on these words by any heating expert with the gift of freely expressing the thoughts that would come to him as he sat and pondered over them. They only occur incidentally in one of the "Notes" of "Megohm" in the "Electrical Times." He wonders if any electrical contractor whose main business is in the City of London has ever made a rough calculation of how many electric fires he could sell and wire for, "if only the price of electrical energy for heating were lower." How much lower is not stated. But the price would have to be very low to be competitive. "Megohm" says there are many thousands of small offices without fire places; and there are even a greater number in which coal fires are a nuisance. In these places, electric fires, he believes, would be readily welcomed if they were not so expensive to run. The present price for heating to the ordinary office user in the City is 2½d. per unit, which means that a 2-KW. fire costs for electrical energy 4½d. per hour, or 3s. for an eight-hour day. This is a figure which would mount to a heavy sum in the course of the winter. At 1d. or 1½d. per unit, the electric fire, he thinks, would be a very attractive proposition. For an eight-hour day, a 2-KW. fire at 1½d. per unit would cost 2s., which, multiplied by the days of use, would be something alarming. At 8d. per therm, 12,500 B.Th.U. can be purchased for 1d. Used at 75 p.ct. efficiency in a gas-fire, 9375 B.Th.U. would be imparted to the room; at 90 p.ct. efficiency, the heating value of three units of electricity would be required to secure a corresponding amount of heat. We are not convinced as to the "attractiveness" of "Megohm's" proposition. But he thinks so well of it (and is of opinion electricity supply undertakings should do the same) that he suggests electrical contractors should approach the two City Companies on the subject of bringing down the price of their energy. In his optimism, too, he sees reasonable hope of the contractors receiving the support of a section of the "B.E.A M.A.," who would be equally interested in the sales of electric fires. No doubt the Gas Light and Coke Company will watch with interest, but without trepidation, any developments in this direction. They are especially concerned, for in the City of London they have an excellent heating connection. Should any efforts be made, we would urge one thing upon the contractors—that they should not recommend the tenants of the offices to use electric fires that are under the needed capacity. We know of one professional man who was tempted to buy a 1-KW. fire; and the last we heard about the matter was that "there is no heat in the beastly thing." Of course, this electric-fire business is useful for gas undertakings. When under-sized fires are employed, electricity gets a bad name; when fires of proper size are used for continuous heating—we will not further rub in the cost aspect.

Increased Cost of Natural Gas.—It is stated by Mr. S. S. Wyer, Consulting Engineer attached to the Department of Mineral Technology of the Smithsonian Institute, that natural-gas prices must become greater. This is not because of any economic law of supply and demand, but because operating costs have greatly increased. The fixed charges on a natural-gas plant represent about 70 p.ct. of the total cost of gas service. Even a marked decline in commodity prices cannot prevent the inevitable increase in natural-gas rates. Each year there is less gas available; and therefore a smaller volume of gas must carry a larger burden of cost. The question is not how cheaply natural gas can be obtained, but whether it can be sold at any price which will ensure continuity of service in the future.

CENTENARY OF THE MAIDSTONE GAS COMPANY.

IN order to celebrate the completion of the first hundred years of existence, the Maidstone Gas Company, on Saturday the 8th inst., entertained at a dinner and smoking concert in the Corn Exchange all their employees who could be spared from the works. As a memento of this centenary celebration, also, an admirable history of the Company, with numerous illustrations, has been prepared by Mr. Frank Livesey (the Engineer and Manager); and from this the following particulars are reproduced. In an introduction to this interesting history, the Chairman of the Company (Mr. George Marsham, J.P., D.L., C.A., C.B.E.), says Mr. Livesey has taken endless trouble to acquire the information, and may be congratulated upon his labours—a sentiment which we heartily endorse. "We are," says the Chairman, "realizing to-day more than ever before that no business is independent, and that it is only by a harmonious unity with other traders and manufacturers that the credit and prosperity of Maidstone can be advanced. It has been the aim of the Directors of our Company, and of the management and the employees, to promote this feeling, and thus to render a real service to the town."

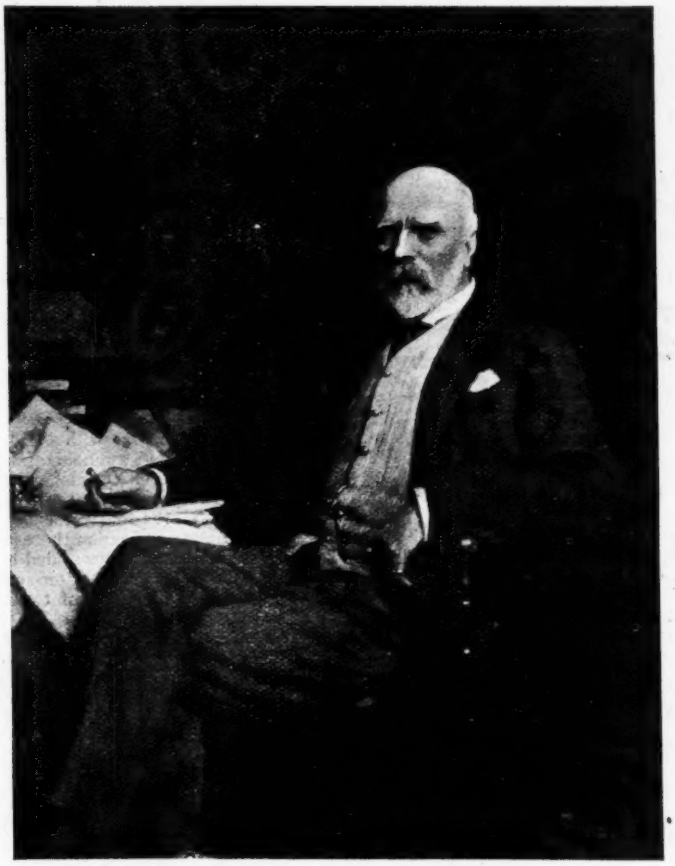
FIRST GAS SUPPLY IN MAIDSTONE.

The first record of the gas supply of Maidstone is contained in certain Articles of Agreement bearing date Nov. 6, 1820, made between the then Committee of Commissioners of Pavements of the one part, and John Gostling, Contractor for Gas, of the other part, reciting that the said John Gostling having proposed to them to undertake to light with gas the streets, lanes, and public places, the Commissioners agreed with him for the lighting of the same for a period of 21 years from Sept. 1, 1822. During the year 1820, Mr. Gostling had been engaged in building gas-works at Canterbury. After having completed his agreement with the Commissioners for Pavements of Maidstone, he made a start on the Maidstone works on Jan. 15, 1821, and a gas supply was available during the summer of that year.

The business was carried on as a private one until the formation of the Maidstone Gas Light and Coke Company (as it was then called) in 1823. The Act incorporating the Company received the Royal Assent on May 23 of that year. The original capital of the Company was £10,000, made up of 200 shares of £50 each. Of this sum £8500 was paid to John Gostling for the works and plant. The Engineer was Mr. John Bryan, who was apparently taken over with the works from Mr. Gostling. The Company immediately began to earn dividends, and in the first year paid 1¾ p.ct., the next year increasing to 6 p.ct.

Although the gas manufactured was not measured in any way, it is estimated that in the first year of their existence the Company sold 1,400,000 c.ft. The chief business of the Company at this time was public lighting, there being 196 public lamps supplied with gas, at an annual charge of £3 each. The Company entered into an agreement with the Commissioners of Pavements to light the streets until the year 1843. Private consumers were charged an annual rent for each burner fixed in their houses, according to the number of hours the lights were in use. The first consumer to be supplied through a meter in Maidstone was Mr. Edmund Wise, of Padsole Paper Mill, who agreed in 1825 to pay at the rate of 25s. per 1000 c.ft. In 1842 the first gas-exhauster was fixed. This was driven by a water-wheel fed from springs which now run into the Medway Brewery. This water-wheel was superseded by a steam-engine in 1854. In 1851 gas-cooking apparatus was first supplied to private consumers.

In the year 1857, the Committee of Management spent £25,000 on capital works, although only £12 500 had been subscribed; the remainder of the money having been found out of the revenues of the Company applicable to dividend. It was therefore decided to obtain a new Act of Parliament, which received the Royal Assent on June 14, 1858. The name of the Company was simplified into the Maidstone Gas Company, and the authorized capital increased to £50,000, divided into three classes of shares—the "A" shares being entitled to 10 p.ct., the "B" shares to 4 p.ct., and the "C" shares to 7½ p.ct. a year respectively. The area of supply was extended to include the parish of Maidstone, and various other parishes and places beyond. By this Act, the control of the Company was placed in the hands of a Board of Directors elected by the shareholders at the annual meeting for a period of three years. This arrangement superseded the former Committee of Management, elected yearly. From 1858 onwards, the history of the Company has been one of continual progress in methods of manufacture and expansion of business.



GEORGE MARSHAM, ESQ., J.P., D.L., C.A., C.B.E.

Chairman of the Maidstone Gas Company since January, 1900.
Chairman of the Kent County Council from 1900 to 1910.

Prior to 1874 all the stoking of the retorts had been done by hand; but Mr. John West, who had been appointed Engineer to the Company in 1869, invented his well-known manual stoking machine, which was installed in the year named in the old retort-house (now pulled down), with the result that the work was lightened for the stokers, and the labour costs considerably reduced. This machine was afterwards adopted in many gas-works throughout the country. This form of machinery, with many alterations and improvements, was used by the Company until 1914, when it was replaced by a modern power-stoker.

Mr. West left the Company's service in 1880, on being appointed Gas Engineer to the Manchester Corporation, and took with him the business he had established in Maidstone, known as West's Gas Improvement Company. This business has now grown into a large and prosperous undertaking.

In 1880 the Company applied to Parliament for powers for raising additional capital, and converted all the three different classes of shares into 7 p.ct. standard stock, subject to a sliding-scale of prices. In the year 1875 the sliding-scale of price and dividend had been first introduced by the Commercial Gas Company, and 1876 found the idea taken up by the Metropolitan Companies. The principle was adopted in the Maidstone Gas Act, 1880. The first standard price granted to the Company was 3s. 8d. per 1000 c.ft., and the "slide" was fixed as follows: For every penny charged in excess, or in diminution of, such standard price in any half-year, the standard rate of dividend for such half-year to be reduced or increased by 5s. in the £100 per annum.

The Company again applied to Parliament in 1903, and obtained further capital powers. The area of supply was extended to cover the parishes of Burham, Leeds, and Hollingbourne; the Hollingbourne Gas-Works being bought. By this time the 7 p.ct. consolidated stock had been increased to £87,600; and, by the Maidstone Gas Act, 1903, this amount of stock was converted into 5 p.ct. capital stock, in the nominal amount of £122 640. This Act also altered the standard price of gas, which was reduced from 3s. 8d. to 3s. 7d. per 1000 c.ft., the slide at the same time being converted from 5s. to 3s. 6d. p.ct. in respect of every movement of a penny in the price of gas.

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Maidstone Gas-light & Coke Works.

25th day of October 183 8

TERMS and STIPULATIONS upon which the MAIDSTONE GAS-LIGHT and COKE COMPANY agree to supply Mr. Stephen Stonestreet with Gas, for the use of his House Stobbies Hill in Maidstone, in Burners of the Numbers and Descriptions, and for the Rents following: viz.—

NUMBER OF LIGHTS.	DESCRIPTION OF BURNERS.	TIME OF USE.	RENTS PER ANNUM. £.	s.	d.
1	Jet in Hall	To Burn from Dusk till 11 o'Clock for 365 Nights	1	10	
1	No 4 Argands	In Office Ditto Ditto 313 Nights	1	15	—
2	No 4 Argands	In Parlor Ditto till 10 365 Nights In Kitchen	5	12	—

The flame not to exceed four inches in height, and to be used within a cylinder glass; if the flame shall be used above that height, the Company shall be at liberty to cease supplying Gas and to cut off the pipes.

The lights to be taken for a year, and continued from year to year; the rent to be paid quarterly, on the 1st of January, the 1st of April, the 1st of July, and the 1st of October, by equal payments, if the light shall be continued the whole year; but if it shall be used for a less period than a year, then the rent to be calculated and paid at the rate of three-eighths of the annual amount for each winter quarter, and one-eighth for each summer quarter; and if the light be commenced at any intermediate period of a quarter, then the rent to be calculated and paid in like manner for such intermediate portion of the quarter

Should there be any intention to change or discontinue one or more burners, one quarter's notice thereof must be given to the Company.

If the rent shall be unpaid for the space of one calendar month, after application for the same, the Company to be at liberty to discontinue the Gas and cut off the collateral pipes.

The collateral pipes and fittings up to be supplied by the Company, at an expense of £ and the fittings within the to be paid by Mr. to be his property; and the collateral pipes without, the property of the Company.

PAGE FROM AN OLD GAS RENTAL.

The Company obtained another Bill in 1907, whereby were added to their area of supply the parishes or places of Harrietsham, Lenham, Broomfield, Chart next Sutton Valence, East Sutton, Sutton Valence, Ulcombe, Boughton Malherbe, and Hunton. The gas-works and undertaking of the Sutton Valence Gas Company, Ltd., were then purchased.

An Order under the Gas Regulation Act was obtained on behalf of the Company, and came into operation on June 9, 1921. The following shows the standard price per 1000 c.ft. as fixed by the Maidstone Gas Act, 1903, and the new standard prices per therm under the Order:

—	Old. Per 1000 C.Ft. s. d.	New. Per Therm. d.
Within the borough of Maidstone and outside the boundary of the borough, but within a radius of one-and-a-half miles from the Town Hall, Maidstone	3 7	15·8
Outside the above radius	4 4	17·6

The dividend slide of 3s. 6d. p.ct. for every movement of 1d. per 1000 c.ft. in the price of gas was converted into a dividend slide of 3s. 6d. p.ct. for every movement of 0·2d. per therm.

The steady development and progress of the Company are shown in the following table:

Year ending June 30.	Gas Made. C.Ft.	Price per 1000 C.Ft. s. d.	Increase in Yearly Output in Decade.
1823	1,500,000	25 0	..
1833	4,000,000	13 6	2,500,000
1843	12,000,000	9 0	8,000,000
1853	30,000,000	7 6	18,000,000
1863	53,736,000	5 6	23,000,000
1873	80,986,000	4 3	27,000,000
1883	125,318,000	3 0	45,000,000
1893	190,347,000	2 5	65,000,000
1903	280,737,000	2 5	90,000,000
1913	348,222,000	2 6	68,000,000
1923	427,000,000	4 5	79,000,000

To meet the increasing demand, and to ensure that gas is supplied at adequate pressure, the Company have laid high-pressure mains as far as Harrietsham and Sutton Valence and Barming, and through these mains gas is pumped at a pressure of 3 lbs. per sq. in. The compressors which feed these mains also supply gas at high pressure for the exterior lighting of shop fronts, now so largely adopted. The area of the district is 78 sq. miles, and the Company own just under 100 miles of mains. They have 11,100 customers, and own 7600 gas-cooking stoves let out on hire, besides the numerous gas-stoves privately owned.

DESCRIPTION OF THE WORKS.

The works are built on land between St. Peter Street and the Medway. The Company own also land on the west side of St. Peter Street, which is used for storage purposes and for the sports ground. The works at present have a manufacturing capacity of 1,500,000 c.ft. of coal gas and 500,000 c.ft. of carburetted water gas per day.

Coal is unloaded from lighters by a Grafton steam crane, with a 1-ton Priestman grab, capable of handling 40 tons an hour. It is delivered by bogies into the three stores, which have a total capacity of 6000 tons. From the stores, the coal is taken by a shaking conveyor to the breakers, and thence elevated into two overhead storage hoppers in the retort-house.

No. 2 retort-house is 150 ft. long. It contains twelve settings of eight retorts 21 ft. in length, capable of a maximum production of 1,500,000 c.ft. per day. Stoking is done with a combined De Brouwer stoker. The arches, which were built in 1855, are now being demolished and entirely rebuilt from ground level, and new ironwork provided. The coke is taken from the house by means of De Brouwer hot-coke conveyors, and a storage of 800 tons of coke is possible without handling.

No. 1 retort house is much older, dating from 1878. It still contains four beds of direct-fired retorts charged by West's manual machinery, and could be used in case of necessity. The remaining portion of this retor-thouse has been divided off, and now contains the two Humphreys and Glasgow carburetted water-gas plants.

The condensers are of the annular air-cooled type; and in the exhauster house are three exhausters driven by steam engines. The boiler house contains three Lancashire boilers, fired by breeze with Meldrum's forced draught. The tar and ammonia purification plant consists of two Livesey washers and two Kirkham-Hulett rotary scrubbers, the liquor circulating by gravity through the four vessels.

For sulphur purification there are three sets of purifiers. No. 1 set consists of four water-sealed boxes, 24 ft. square by 5 ft. 6 in. deep; No. 2 set, of four water-sealed boxes, 24 ft. square by 5 ft. 6 in. deep; and No. 3 set, of two dry-lute purifiers, each 42 ft. by 20 ft. by 5 ft. 6 in. deep.

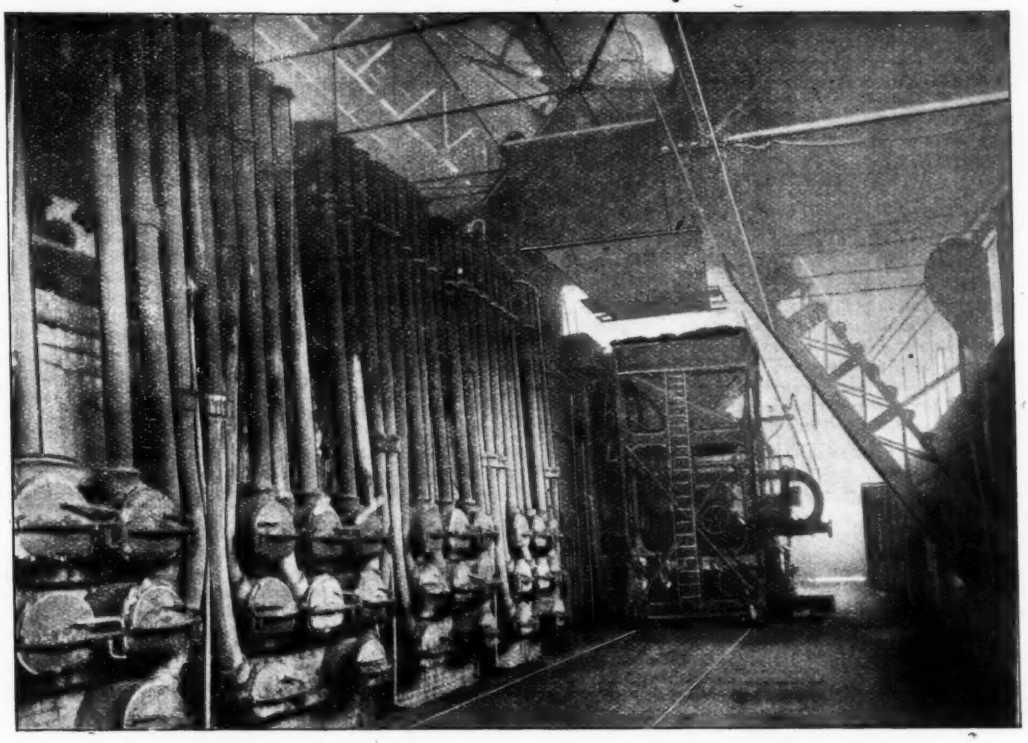
There are three gasholders—of 1,200,000 c.ft., 450,000 c.ft., and 230,000 c.ft. capacity, respectively.

The tar is treated in a Wilton's dehydration plant, to render it suitable for tar macadam manufacture; and the ammoniacal liquor is sent away in tank barges for manufacture into sulphate of ammonia.

STATEMENT OF CAPITAL AND DIVIDENDS.

The present amount of capital stock, including premiums, is

THE SHOWROOMS—MIDDLE ROW, MAIDSTONE.



NO. 2 RETORT-HOUSE—NOW IN THE COURSE OF COMPLETE RECONSTRUCTION.

£165,736. There have also been issued 3 p.ct. debentures to the amount of £63,480.

The Company, since inception, have never passed their dividend; the lowest dividends ever paid being 1¾ p.ct. in 1824, and 3¾ p.ct. in 1919 and 1920, the two post-war years. The record since the outbreak of war is as follows:

Year.	Dividend per Cent. per Annum.	Price of Gas per 1000 C.Ft.
	£ s. d.	
1914	7 5 6	2s. 6d.
1915	7 0 3	2s. 6d. and 2s. 9d.
1916	5 14 0	2s. 9d., 3s., and 3s. 6d.
1917	5 3 6	3s. 6d.
1918	4 2 6	4s.
1919	3 15 0	4s. 4d.
1920	3 15 0	4s. 10d.
1921	4 17 6	5s. 2d.
1922	7 7 3	13·4d. and 12·8d. per therm.

DIRECTORS AND OFFICIALS.

The booklet includes a list of Directors or members of Committee since the beginning. There is also a list of officials, which shows the following as having served the Company in the capacity of Engineer.

Engineers.

John Bryan	Appointed in 1823
Samuel Bartlett	,, ,, 1839
John Somerville	,, ,, 1859
John West	,, ,, 1869
Henry J. Smythe	,, ,, 1880
Frank Livesey	,, ,, 1911

Below are the names of the present Directors and chief officers of the Company:

Directors.—George Marsham, J.P., D.L., C.A., C.B.E. (Chairman), Charles E. Hoar, M.D., J.P., Frederic Laurence, J.P., William Day, J.P., C.C., Edward Hills, J.P. William H. Bensted, George Foster Clark, J.P.

COKE YARD.

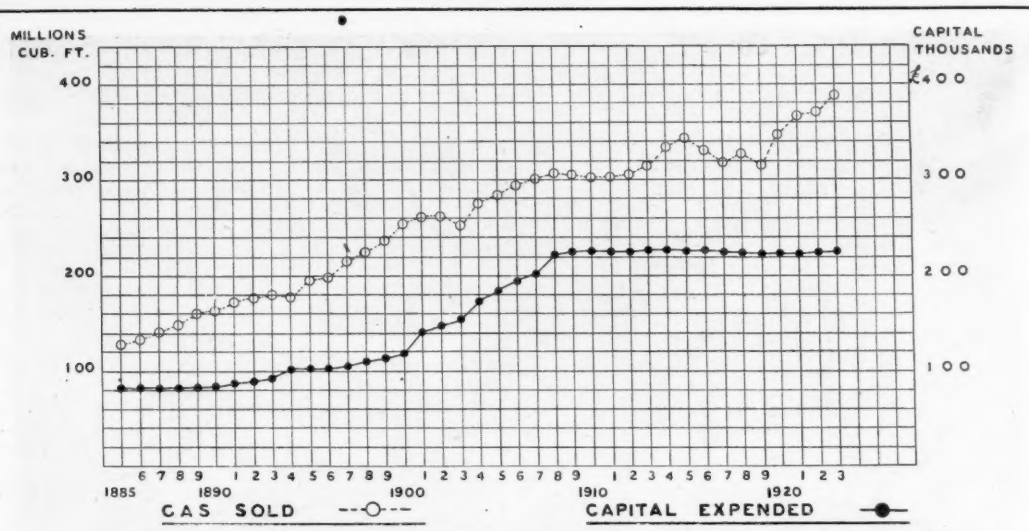


CHART SHOWING CAPITAL EXPENDITURE AND GAS SOLD FOR THE PERIOD 1885-1923.

Auditors.—Francis W Wright, Bernard A. Smythe.
Engineer and General Manager.—Frank Livesey, M.Inst.C.E.
Secretary and Accountant.—Frederick A. Gulland.
Solicitor.—William H. Whitehead, Under Sheriff for the County of Kent.

THE CENTENARY DINNER.

As already mentioned, the centenary was celebrated on Saturday, the 8th inst., by a dinner and smoking concert in the Corn Exchange, at which the Company entertained all the employees who could be spared from the works. Those present numbered 175; and they enjoyed an excellent dinner cooked by gas. Mr. Frank Livesey was in the chair, and was supported during the evening by Mr. George Marsham, J.P., D.L., Mr. E. Hills, J.P., Mr. F. Laurence, J.P., and Alderman William Day, J.P. After the Loyal Toast,

Mr. MARSHAM proposed the health of the employees, and said the Company were rather pleased with themselves, as they had reason to be. A hundred years was a long time, and with them it had been a hundred years of steady and sure progress. This would not have been possible without the cordial support of the employees. He need not go into details, as the progress of the Company had been fully described by their worthy Chairman in his able and interesting little history, a copy of which they had all received. He knew their Chairman and the Secretary would excuse him from mentioning them specially. His brother Directors and himself had many opportunities of seeing them, which they were necessarily not permitted with regard to the other employees, to whom he was now glad to say a word or two. The Company had 183 employees. The oldest employee, Alfred Beadle, was aged 75, and was engaged by the Company in 1877. He had just "pipped" him (Mr. Marsham) by one year, as his own connection with the Company began in 1878. Two of the foremen, George Merrall and Charles Sayer, had served them for 42 and 41 years respectively. Again, 56 of the employees had worked for the Company for over twenty years. Was not this a record to be proud of? The Directors and he were proud of it; and he ventured to hope that the employees also considered such a record was creditable both to the Directors and themselves. And now he wanted to say a word on the other side of the matter. He was one of those who thought that "all work and no play made Jack a dull boy." He was indeed glad that the employees had started a Sports Club, and that it was in a flourishing condition, with 96 subscribing members. The Directors wished it every success, and desired to give it every encouragement. He proposed the health of the employees from the bottom of his heart. He thanked them all for their good services and their loyalty to the Company, and wished them the best of luck in the future. With the toast he coupled the name of Mr. George Merrall, who had served them so long and faithfully.

Mr. MERRALL, in responding, said that it was a great pleasure to see around him so many faces which he had known from boyhood. He himself had worked for over forty years for the Company under three Managers. He could say that the present Manager and Directors always did all they could to assist the Inspectors in anything they reported as being necessary; and the result was that the men stayed with the Company. He thanked the Directors for the assistance and sympathy which they had given to the Sports Club, and for the gift of the Centenary Book, which he had found most interesting.

Mr. CHARLES SAYER (Works Foreman) proposed "The Maidstone Gas Company," remarking they would all agree that in Mr. Marsham they had a gentleman of the highest standing, who was always ready to help all of them. The other Directors, too, made one of the finest Boards in England

Mr. FREDERIC LAURENCE, replying for the Directors, said it was a great pleasure to him to sit on the Board of the Company. The Directors always worked in the greatest harmony. He considered that they had a good staff and body of workmen, who all worked well together for the benefit of the Company. He was one of those who believed that all profit and wealth came from labour; but they must all remember that there was another essential, capital, without which their business could not have been built up and extended.

Alderman WILLIAM DAY also responded, and said he was glad to see so happy and prosperous a gathering of men round him. He was very pleased to be associated with the Company as a Director. He and his brother Directors all greatly respected and loved Mr. Marsham, and enjoyed working with him.

Mr. EDWARD HILLS proposed the health of Mr. Frank Livesey. He knew the workmen had a warm friend in Mr. Livesey, who was always anxious to do his best for them in every way.

Mr. LIVESEY, in reply, thanked the company present for the way in which they had received the toast. He said that a hundred years was a long period, even in the life of a company. Ever since the foundation, the Company had had no difficulty in getting the thrifty citizens of Maidstone to come forward and entrust their savings to them for investment, and he did not think that any had regretted doing so. The growth of the Company was a steady one; and he did not remember any autumn and early winter in which the fittings department had been so busy as the present year. The number of labour-saving devices—in other words, gas-consuming appliances—which they had fixed this autumn was really amazing. He was glad to see such a large gathering and, among other faces, several of their old pensioners who had been able to come. Such success as had been achieved was due to the keenness, alertness, and initiative of a large number of his fellow-workers, to whom he gave his cordial thanks.

After the toasts, the Chairman of the Company, on rising to leave, was greeted with musical honours; and an excellent programme was afterwards carried out. At the conclusion of the programme, Mr. Livesey, in moving a vote of thanks to the artistes, expressed his regret that his colleague Mr. F. A. Gulland, who had arranged the musical programme, had unavoidably been prevented from attending. He asked all the men to accept a box of chocolates, to take home to their wives as a gift from the Directors.

YORKSHIRE JUNIOR GAS ASSOCIATION.

A largely attended meeting of the Association was held last Saturday at the Bradford Corporation Gas Department Showrooms. The PRESIDENT (Mr. W. Heathcote, of Halifax) was in the chair.

The following papers were read:

Mr. A. T. PLANT (Halifax), on "Modern Carbonization in Continuous Vertical Retorts."

Mr. W. I. INESON (Bradford), on "Naphthalene: Its Deposition from Coal Gas."

The papers and discussions will be published next week.

On the motion of Mr. J. W. ROPER (Bradford), seconded by Mr. J. B. BALMFORTH (Bingley)—who suggested that the Council should try to arrange for papers to be in the hands of members several days before delivery, in order to stimulate further discussion—the authors were heartily thanked for their contributions.

Gas Supply Students at the Royal Mint.

Recently a party of the students taking the course in gas manufacture and supply at the Goldsmiths' Institute, New Cross, under the leadership of Mr. Thomas Holgate and Mr. W. J. Liberty, visited the Royal Mint, by the courtesy of the Deputy Master, and inspected the high-pressure gas-furnaces used in the melting of metals for coinage. These furnaces are the outcome of some pioneer work by the Commercial Gas Company many years since, when they displaced coke as fuel for heating the crucibles. At the conclusion of the visits (which extended over two days), the parties journeyed to the City of London, where Mr. Liberty gave a demonstration in the streets of the raising and lowering of the centrally suspended high-power gas and electric lamps employed for the public lighting. The students at the same time took the opportunity of inspecting the lighting of the principal thoroughfares of the City with Mr. Liberty, who supplied them with data *en route*.

NATIONAL GAS COUNCIL.

Central Executive Board Meeting.

A Meeting of the Central Executive Board of the National Gas Council was held at No. 30, Grosvenor Gardens, S.W., on Tuesday, the 11th inst.—Mr. D. MILNE WATSON in the chair.

DIVERSION OF HIGHWAYS.

It was reported that, in contemplation of the diversion of certain public highways, a Gas Company had been requested by the London County Council to remove their mains and relay them in another position. The Gas Company, in exercise of their legal rights, had declined to bear the cost of this work.

The London County Council are now approaching Metropolitan Boroughs and all road authorities throughout the country, inviting their views on this matter, and suggesting that, inasmuch as private Statutory Companies have the right to use public streets without charge for the purpose of laying down pipes or wires, such right should not involve an obligation upon the local authorities to keep such streets unaltered, and if such streets were diverted or altered the local authorities concerned should not be called upon to bear the cost of the necessary removal and relaying of such wires or pipes.

This proposal of the London County Council is in direct opposition to the statutory rights of the gas industry; and it was decided that any action which might be taken by the London County Council or road authorities should be opposed with the utmost possible vigour. Appropriate steps were accordingly taken to deal with the situation.

RAILWAY COMPANIES' BILLS.

The Bills which the railway companies are promoting this session in Parliament were discussed, and a Committee were appointed to consider the same, and to report back to the Board thereon.

RATING OF MACHINERY.

It was reported that the Minister of Health and the Secretary for Scotland had appointed a Committee to inquire into existing law and practice in regard to the rating of machinery and plant in England and Scotland, and to make recommendations as to what variations in the law are desirable and practicable, having regard to the financial and other considerations involved, with a view to removing inequalities and, if possible, assimilating the law and practice of the two countries.

A Committee of the Council were appointed to consider the position, and to ascertain what evidence (if any) on behalf of the gas industry should be given before the Departmental Committee.

UNEMPLOYMENT GRANTS COMMITTEE.

It was reported that, since the last meeting of the Board, letters had been received from the Private Secretary to the Ministry of Labour and from the Secretary of the Unemployment Grants Committee respectively. It appeared that the Unemployment Grants Committee regarded mainlaying schemes in general as work which should be assisted in suitable cases.

STANDARD SPECIFICATION FOR ILLUMINATING MATERIALS.

A communication was reported from the British Engineering Standards Association, stating that they had been asked by the National Illumination Committee of Great Britain to undertake the preparation of British standard specifications for material and apparatus used in connection with illumination. In accordance with their usual procedure, the Association propose to call a conference of interested parties, in order to ascertain whether the consensus of opinion is favourable to such work being put in hand. The Association asked the Council to appoint a representative to such conference. Mr. F. W. Goodenough was unanimously appointed to represent the Council.

GAS FUND UNDER SECTION 7 OF THE GAS REGULATION ACT.

The Chairman reported that the Board of Trade had announced that the Gas Fund raised under powers granted under section 7 of the Gas Regulation Act would be reduced from 3s. for each million c.ft. of gas sold by gas undertakings in the preceding year to 2s., as from Jan. 1, 1924.

MODEL BYE-LAWS AND REGULATIONS FOR THE PREVENTION OF CONTAMINATION, WASTE, OR MISUSE OF WATER.

The National Gas Council have been invited to give evidence before the small Committee appointed by the Ministry of Health to advise the Ministry as to the amendments necessary to the Model Bye-Laws (Series 21) and other matters. The position was considered, and representatives of the Council were nominated to attend the meeting of the Committee.

SULPHURIC ACID.

A question was asked as to whether any decision had been arrived at with regard to a further reduction in the cost of acid. The present cost was still very prejudicial to the smaller undertakings, and a suggestion was put forward as to the steps which might be taken to bring about a reduction.

VALUATION OF GAS-WORKS IN SCOTLAND.

A Reply.

AT first blush, on reading the article on the above subject in the "JOURNAL" for Dec. 5, one gathers the impression—the fleeting impression—that the contributor has conceived the idea that the article of Aug. 29 last was written by some Englishman or a member of such Southern race, or maybe by some Irishman from England practising in Scotland and not conversant with the established principles and the practice of valuation in Scotland. However, delving deep, one sees that the Scottish expert rather tends to show that the previous contribution was of some value, as the clearly expressed views in that article were that the established principle and practice of valuation in Scotland is so antiquated as to be inapplicable to gas valuation at the present time; in fact, the Scottish contributor admits that the judgment given in the year 1883, forty years ago, was the result of an appeal at the instance of only one gas company, yet the case settled the principle followed ever since in Scotland in valuing gas-works.

TENANTS' CAPITAL.

He goes on to point out that observations by the late Lord Low in the Kirkcaldy Gas Light Company's appeal in 1905, eighteen years ago, disallowing cooking stoves as tenant's chattels, are quoted in the original article, but that his Lordship's decision upon this point has been generally regarded by assessors as "unsound," and for this reason "ignored." This was the contention in the original article, but not expressed in quite the blatant language of the cold North; and it is very satisfactory to find that a Scottish expert, from his fount of knowledge, endeavours to show that the contention was absolutely accurate, and that antiquated principles should be disestablished and relegated to the archives of the past.

It may be useful to say that, with regard to the inclusion of cookers in the capital a tenant would require to provide in order to earn the receipts, it is within the writer's experience in dealing with a large number of cases in Scotland in the last twelve months that some of the assessors did include cookers as part of the tenant's capital, after the claim had been raised on behalf of the Company. It would be well for the Scottish expert to look up the report of the cases which in September last came before the County and Burgh Valuation Committees on this very point; he will see that the gas companies in a number of instances were faced with the argument that these had been disallowed by Lord Low in his judgment in the Kirkcaldy case, and it was by *authority* that these had been omitted by the assessor as part of the capital that a tenant would require to earn the receipts. In a great number of instances dealt with by the writer, the assessors took as the tenant's capital in their original valuation the value of the meters and stoves as appearing in the company's accounts. In one case, where the company had something over 1400 meters and over 900 cooking stoves and fires, the amount appearing in their accounts was slightly over £400. Does the Scottish expert think for one moment that £400 would be the price or the value of 1400 meters and 900 cooking stoves at the present time, after allowing a very liberal amount for depreciation? It must be obvious to anyone with a knowledge of the gas industry that such a figure would not, by a wide margin, represent the present value of such appliances. The third paragraph of the article by the Scottish expert suggests that there is great difficulty, more especially south of the border, in the true adjustment of the tenant's capital, and that the Lands Valuation Assessors have an advantage over rating valuers in England when dealing with machinery and plant. In Scotland, of course, it is well known that all machinery except first motive power is excluded as part of the heritage, and to the present writer this proposition presents no difficulty whatsoever.

Some of the Scottish expert's views are certainly startling. Take, for instance, his statement that the average amount of tenant's floating capital should be less in Scotland than in England, because "rents are paid only twice annually." What has this to do with the amount of the capital that a tenant would require to earn the receipts? In Ireland, until recently, it was not considered in the fashion to pay rent, rates, or taxes; but the writer did not find that the tenant of a concern like a gas undertaking required any less capital to earn the receipts on account of any custom peculiar to the country! Let us consider for a moment what the tenant really has to provide. He has to provide, among numerous other items as set out in the original article, a certain number of months' working expenses to earn the receipts—how much working expenses being largely dependent on how often he collects his receipts from ordinary meters and prepayment meters. In Scotland the accounts of gas undertakings are collected at various periods. In one instance dealt with by the writer, the ordinary meters were read monthly and the amount due collected; the slot meters being collected at the same time. Anyone with any knowledge of the industry will at once appreciate the Scot's caution and acumen in reading his meters and collecting his slot-meters as often as possible. In other cases the meters are read quarterly, half-yearly, or sometimes three times a year; and, of course, in fixing the capital required to earn the receipts, the prudent tenant takes into consideration the period which elapses before he can collect his accounts. Naturally the Scot—with the super foresight—who reads and collects ordinary and slot meters at least

once a month, does not require so much tenant's capital as the hypothetical tenant who reads them quarterly, half-yearly, or three times a year.

Interest Allowed and Income-Tax.

The next point raised is the rate of interest to be allowed on tenant's capital. The "audacious suggestion," he continues, that the tenant is entitled to 10 p.ct. is fallacious in that it is apparently assumed that he would have to borrow the capital embarked by him in the business. There is not the slightest justification for such an assumption in any single word or phrase in my last article. One must assume, and I do assume, that the hypothetical tenant about to enter on the occupation of a gas undertaking, is a man of substance; but let us analyze what this "audacious suggestion"—to allow 10 p.ct. on tenant's capital—actually means. The principal cases reported in the various leading Scottish Law reports show that the Judges of the Court of Session have allowed 5 p.ct. interest and 20 p.ct. for tenant's profits; and I will endeavour to explain why the claim of 10 p.ct. was made, and how it can be justified. As is well known, the revenue principle is adopted to arrive at the letting value of a gas undertaking in Scotland. The gross receipts having been ascertained, there fall to be deducted the working expenses necessarily incurred by the tenant to earn the receipts; and I suggest that at this stage of the valuation no deduction in these working expenses should be made for tenant's rates. Let us assume now that the net receipts have been ascertained. These fall to be divided between the landlord, for rent, and the tenant, for remuneration and profit on the capital which he has at stake; in addition, there are two other people waiting not very far in the background who also require a little attention—one is the rate collector, the other is the income-tax collector. All these gentlemen hope to be satisfied out of the profits that can be earned by the acumen of the tenant of these gas-works. As I have endeavoured to show, twenty years or more ago it was the custom to allow 5 p.ct. interest on tenant's capital, the income-tax then being 9d. in the pound; to-day we have an income-tax of 4s. 6d. in the pound. Scottish judges in a large number of cases have held that income-tax is a charge upon the tenant; and it is not suggested otherwise by the writer. Does it make no difference whatever, whether income-tax is 6d., 9d., 4s. 6d., or 5s. in the pound, in the amount of remuneration the tenant will require on his capital? For it must be borne in mind that the tenant is called upon to pay income-tax on the profit that he can make, not only on the capital which he has sunk, but also on that which the landlord has sunk, in the concern. To illustrate my argument clearly, let me give a concrete instance. In one case with which I dealt, the income-tax actually paid represented 10·06 p ct. of the capital which the tenant had to provide. I wonder if the Scottish expert has ever given this matter sufficient thought to realize what this allowance should actually be.

It is recommended to gas undertakings that they should take their payment for income-tax and divide it by the amount which is allowed by the assessor in the annual valuation in respect of tenant's capital and for tenant's profits, and then see what percentage the income-tax bears to the figure allowed. In the particular case mentioned, the gas undertaking had before them an income-tax demand note for £325. The assessor allowed them £83, which represented 5 p.ct. on the tenant's capital which he had brought out, and £239 for tenant's profits, making a total of £322 to hand over to the income-tax collector. No doubt this assessor anticipated that for the other £3 the tenant of the gas-works would dive deep into the proverbial stocking which every canny Scot keeps somewhere—at least, so one must assume, if the contention of the assessor was right. At all events, the Valuation Committee on appeal adjusted the item and allowed 7½ p.ct. interest on the tenant's capital.

Now let us for one moment consider what are the actual facts as regards the allowances in the specimen valuation that was set out in the original article. According to the Scottish expert, where the tenant has much less invested than the landlord, and is allowed the sum of £3585 in the name of interest and profit, out of this no less than £1738 12s. has to be handed over to the income-tax collector, and the hypothetical tenant is left a sum of £1846 8s. as interest and profit. The landlord, as shown, has £1905 as rent, and the rate collector £635.

I venture to express the opinion that this point of the effect of income-tax on tenant's remuneration is often lost sight of in dealing with the valuation of gas undertakings, and I commend the point to the consideration of every gas manager. In the last two or three years the writer has dealt with the assessments on several hundred gas undertakings, and has very carefully analyzed the figures appertaining thereto at the time the valuations were gone into, comparing many with the conditions existing a quarter of a century ago. It is easy to, and many valuators do, fall into the same error on this question as the Scottish expert; and I am convinced, having regard to the circumstances of the industry subsisting to-day, that, when a gas undertaking in Scotland takes the question of its valuation before the Court of Session, the opinion expressed by Lord Low, but not followed out by some assessors, will be reversed.

Occupier's and Landlord's Rates.

There is another interesting point which my critic raises—the Scottish system of deducting the actual occupier's rates which have been paid according to the accounts. Let us consider it from both the landlord's and the tenant's point of view. Suppose in one year the rental value is £1000, and for the sake of argument say a competitor has for some reason arisen—an electrical undertaking or some such concern—and that the letting value of the gas undertaking has fallen to £500 a year. Would it be proper, is it right, is it just, to deduct the rates in order to get at the rent that was paid on the £1000? I submit that it is wholly fallacious to do so, and that the rental value of £500 should be the factor for determining the rates allowance. The Scottish expert says that the method is doubtless well suited for the English system, but to the Scottish undertakings it is not—"the pipes in Scotland may extend, even in one county, into a score of separate rating areas." Does he think that such conditions do not arise in other countries? At the present time, I am dealing with one undertaking which extends into six poor-law unions, and forty-one parishes, contained in two counties. What is the difficulty? I see none; in fact, as a mathematical proposition it is far more accurate to ascertain the letting value in each parish *plus* rates, and deduct the rates properly chargeable for each area that would be payable. There is a very easy formula for doing this, which was set out in the original article, and which is very well known to valuation experts. May I with deference suggest that the Scottish expert has obviously failed to grasp the proposition? As is shown in the specimen computation, after deducting from the rental value *plus* rates of £2540, the rates which would be payable, it would leave a rental value of £1905.

With reference to deducting the landlord's rates to get at the actual rent, the entry in the valuation roll now includes rental value *plus* owner's rate—that is, rent added to the landlord's rates makes up the total. The writer is fully conversant with the practice in vogue in Scotland, but is of the opinion that to charge rates on rates is wholly wrong, is, in fact, a flaw in the Scottish practice. The definition of yearly rent or value according to the Land Valuation Act, 1854 (17 & 18 Vict., cap. 91, s. 6), is: "In estimating the yearly value of lands and heritages under this Act the same shall be taken to be the rental for which, one year with another, such lands and heritages might in their actual state be reasonably expected to let from year to year . . . without grassum or consideration other than the rent, such rent shall be deemed and taken to be the yearly rent or value of such lands and heritages in terms of this Act." It is submitted that in the entry in the valuation roll the figure does contain some *consideration* other than rent; and notwithstanding numerous cases in which the Court of Session has held that the landlord's rates must be included in the figure to enter the Valuation Roll, it is the opinion of the writer that this is illogical, and is a great hardship on the ratepayer and, in the case of a gas company and its consumers, an unjust burden. In the case set out in the original article, this payment for landlord's rates represented no less than 1·85d per 1000 c.ft. of gas made per annum, and on the actual sale of gas a figure in excess of this.

It will be as well, for the benefit of the gas undertakings, to consider this point a little further. Section 41 of the Lands Valuation Act, 1854, says:

> "Nothing contained in this Act shall alter or affect any classification or power of classification, or any deduction or allowances, or power of making deductions or allowances, from gross rental, made or possessed by any body persons or person entitled to impose or levy assessments, but the same shall not affect the value to be inserted in the valuation roll in terms of this Act; and nothing contained in this Act shall exempt from or render liable to assessment any person or property not previously exempt from or liable to assessment."

Section 37 of the Poor Law Relief (Scotland) Act, 1845, says:

> "And be it enacted that, in estimating the annual value of lands and heritages, the same shall be taken to be the rent at which one year with another such lands and heritages might in their actual state be reasonably expected to let from year to year, under deduction of the probable annual average cost of the repairs, insurance, and other expenses, if any, necessary to maintain such lands and heritages in their actual state, and all rates, taxes, and public charges payable in respect of the same."

In Scotland it has been the practice of the parochial authorities in the past to allow the deductions for certain rates only from the entry in the valuation roll; a varying deduction of from 10 to 33⅓ p.ct. being assumed sufficient to comply with the requirements of this particular section 37 of the 1845 Act. If one looks closely into the question, it will be seen that what has to be deducted is "the probable average annual cost of repairs, insurance, and other expenses, if any, necessary to maintain such lands and heritages in their actual state, and all rates, taxes, and public charges payable in respect of the same." This inadequate deduction of 10 to 33⅓ p.ct. is applied to certain of the rates payable in the parishes throughout Scotland; but take one notable exception—that of the "county rate." The county council levy and demand payment of the rates on the basis of the entry in the valuation roll, and no deduction whatsoever is allowed from that entry; and it will be seen as regards county rates that the occupiers are called upon to pay rates upon rates. It is no uncommon thing that in these municipal and county Acts of Parliament clauses which have never been contested in their original state creep-in and become law. In the course of time the effects of such clauses are realized, and the injustice recognized; but it is an exceedingly costly matter for an individual to upset an Act of Parliament. It is, of course, to the advantage of the county council to have a high gross annual rental upon which to

levy their rates, as the rate in the pound is thus kept on a lower basis than if the true annual value excluding the owners' rates appeared in the roll. Years ago, when the rates in the pound were at a much lower figure than at the present day, the question did not possess the importance which it has now attained owing to the very heavy rates for county commitments. This does not alter the principle; but it is a practice that has been allowed to remain, and, notwithstanding that it has the sanction of the Judges in Scotland, in the opinion of the writer it is wrong.

THE "CREDULOUS SCOTTISH COMPANIES," AND OTHER POINTS.

The Scottish expert gives as his opinion that the general inference to be drawn from the specimen valuation under review is that it was put forward to attract the attention of credulous Scottish gas companies. In all probability he knows a good deal more of the credulity of the Scottish mind than the present writer; butsuch a suggestion as between experts seems unworthy, and would emanate far better from the mind and thoughts (shall we say) of an ex-Cabinet Minister. The object, of course, in writing the original article was to assist the gas industry generally, and more especially the small undertakings, for in Scotland, the larger undertakings are dealt with by the Assessor of Railways and Canals. I suggest to my critic that he should obtain from that gentleman a copy of his computation of the letting value of a gas undertaking, and compare it with a computation by a county or burgh assessor; and he will at once see the difference in the basis. This comparison can be made with either a profit-earning or a non-profit earning undertaking.

It is suggested that there is difficulty in obtaining uniformity of practice. My mentor must know that in Scotland the assessors meet as a body and discuss various points raised in connection not only with gas valuations but other valuations; and as a matter of fact it is within my knowledge that, subsequent to my being engaged to advise a number of gas undertakings, a meeting did take place, at which various points were discussed, and the principles and practice to be adopted were settled. Had the principles and practice settled at these meetings been followed by the assessors throughout Scotland, then surely there should have been no divergence of opinion between them; but in many instances it was a question of a little knowledge being dangerous, and it was obvious that many of the assessors had not the grasp of the subject necessary to make a valuation of a special property like that of a gas undertaking.

In his last paragraph, which is beyond the understanding of the present writer, the Scottish expert says "the Scottish Courts have held that in such circumstances no distinction falls to be made, except as regards the items mentioned, between landlord and tenant in dealing with the working expenses for valuation purposes." In assessing a statute-barred undertaking—that is, an undertaking precluded from making profits in Scotland—there falls to be deducted the whole of the working expenses incurred both by landlord and tenant, and no allowance is made for tenant's profits. It must be obvious, even to the uninitiated, that the specimen valuation related to a profit-earning concern, seeing that a deduction was claimed in respect of tenant's profits.

With reference to the figure in the tenant's capital "Cash at Bank, £2895," would any tenant enter upon the occupation of an undertaking like this without supplying himself with floating cash? In all probability the landlord would want to know something about the status of the intending tenant; I venture to think that no landlord who saw that the tenant had not sufficient cash to allow him to meet any reasonable contingency would let his property to him. There is a further factor in this matter—such a claim has already had the sanction of the Court of Session in another case, or, to use a phrase much in use by assessors in Scotland, this is "sanctioned by Authority;" and the writer was the first to make a claim for such an item to be included in the tenant's capital of this class of concern in Scotland. On reference to the case of the *Urban Electric Supply Company v. The Burgh of Hawick*, Jan. 5. 1916, it will be seen that the Lands Valuation Appeal Court Judges did not allow a claim under this particular item. The Scottish expert does not challenge this item on the grounds of quantum, but perhaps this is another decision of the Court of Session which he is graciously pleased to ignore.

The deeper and deeper one delves into the views expressed, the more extraordinary they appear. He states that the net receipts are undoubtedly a better test of ability to pay than the gross receipts, and goes on to enlarge upon certain items in the account. I wonder if he considers that these gas undertakings are run as philanthropic institutions. Surely he must know that with the price of coal as it was in the three years under discussion it was imperative for the undertaking to increase the price of gas so as to meet its obligations, and consequently the net receipts would not greatly differ over a period of years. At all events, in terms of the 1854 Lands Valuation (Scotland) Act the lands and heritages have to be valued in their actual state, and any inquiry into "might have been" would appear superfluous.

The contribution of the Scottish expert has been undoubtedly exceedingly valuable in bringing to light and emphasizing a number of errors which are made in these valuations for the purpose of assessment; and it would be exceedingly useful, especially to the smaller undertakings, if other contributions were forthcoming on this difficult and admittedly highly technical subject. At the present time, to many smaller undertakings the rates and taxes are a positive burden; the consumer, in some cases that have been placed before me, paying as much as 10d. per 1000 c.ft. of gas consumed in respect of these outgoings for rates and taxes. Surely there must be something radically wrong with a calculation for letting value that can bring out such a result! For the benefit of the gas undertakings, and not with any desire (as has been suggested) to benefit myself, I have communicated to the "JOURNAL" my views on the subject.

The great anomaly is brought out to a large extent in one item alone—and that is, in the allowance in respect to tenant's capital. If more co-operation in this direction could be brought about in the gas industry in Scotland whereby the views of the various gas managers on this question of rating could be assimilated, it would be very greatly to the advantage of the industry, to say nothing of the consumers' interests. There is an avenue by which this important subject can be approached. Week by week a valuable journal is issued giving information and statistics in respect to the industry and much technical information. Surely its columns could be utilized with advantage in connection with this question of assessments. As for the experience of the writer, it is always available to the "JOURNAL" for the elucidation of any point that may arise and upon which any gas undertakings may require assistance.

HYDROCARBONS FROM WATER GAS.

Production of a Synthetic Oil Mixture.

In the issue of "The Petroleum Times" for Dec. 1 reference was made to an interesting proposal for the synthesis of hydrocarbons from water gas, due to Fischer and Tropsch, of the Kaiser Wilhelm Institute für Kohlenforschung, at Mülheim. A lengthy account of the process was given in the September issue of "Brenstoff-Chemie," under the title of "Production of a Synthetic Oil Mixture from Carbon Monoxide and Hydrogen." The authors state that the production of oil from coal can take place in two ways; one being the hydrogenation method, and the other by first gasifying the coal, and then treating the gas so as to obtain a liquid petroleum substitute. It is with the latter method that the authors are concerned.

The initial step is the distillation of the coal at a comparatively low temperature, by which the usual volatile products and a solid residue of semi-coke are obtained. The volatile products are dealt with as in ordinary practice. The second stage is the conversion of the semi-coke into water gas. The gas is then purified, notably from sulphur compounds, and is passed through a tube-like apparatus in which it is subjected to a pressure of 150 atmospheres (about 2000 lbs. per sq. in.) and a temperature of from 400° to 450° C., in the presence of iron filings or shavings coated with a contact agent, which may be potassium carbonate. Under these conditions the gas is chemically changed, and, on passing into a cooled receiver, forms a liquid which separates into a watery solution and an oily layer; the proportions being roughly two of the former to one of the latter.

Experiments up to this stage, but under somewhat different conditions as to the gas mixture and contact substances, were carried out by the Badische Anilin- und Soda-Fabrik some years ago; and several German patents were taken out covering processes of a similar nature. But the authors state that by following the conditions specified in these patents they get products differing materially from those they have themselves obtained by their own method. The Badische Anilin- und Soda-Fabrik appear to have abandoned their researches, because of the nature of the product, which consisted of saturated and unsaturated hydrocarbons and many other substances, which appeared to render hopeless the possibility of obtaining useful commercial products in an economical manner.

The work of the authors, however, has proved that out of the complex mixture of different classes of compounds and different compounds of each class a substance valuable as a motor fuel can be produced, and that by a further treatment hydrocarbons having the odour and characteristics of naphthenes can be produced.

The types of product from the compression and heating of the water gas consist of a number soluble in water, forming the watery solution, and others which will neither dissolve in nor mix with water, and which form the oily layer. The watery solution has been found to contain, among other substances, formic, acetic, propionic, and some higher fatty acids, amounting to about 10 p.ct. of the products; methyl, ethyl, and propyl alcohols, acetone, and methyl-ethyl ketone, amounting to about 29 p.ct. of the products formed; oily substances partially miscible with water up to 11 p.ct.; and oily compounds, consisting mainly of the higher alcohols ranging up to $C_9H_{12}O$, and a small proportion of esters and carbohydrates, amounting to about 50 p.ct. of the products.

Opportunism.—It has become customary for the "Croydon Times" to publish at Christmas time a supplement in the form of a shopping guide. This has a wide circulation, and is carefully read. It is consequently an excellent advertising medium. In this year's issue we notice an article which gives the public much useful information concerning the Croydon Gas Company, showing that, during the last ten years, the output of gas has increased from 1,280,565,300 c.ft., to 2,142,400,300 c.ft. per annum, and the number of cookers and fires on hire from 26,248 to 51,256.

GAS-FIRES AND RETROGRESSION.

Absurd Claims.

WERE it not for the fact that the launching of the "Oxynydor" is liable to have a pernicious effect on a certain section of the community, we should have been content to laugh good-humouredly at this ridiculous "invention" and the claims advanced by its promoters—the Yorkshire Steel Company, Ltd. The name "Oxynydor" alone is suggestive of some monstrosity, but the descriptive literature is sufficiently direct to call for a little comment.

As a result, we presume, of many weary years of research work, the following remarkable statement is made: "If you sell a man a gas-fire, he will use it as little as possible; but if you sell the fire with an 'Oxynydor,' he will use it all the time, because the 'Oxynydor' makes gas-fires as pleasant and healthy as coal-fires." Here is another brilliant conclusion: "Some gas-fire manufacturers advertise that their gas-fires do not dry the air. Besides being scientifically impossible, this is contrary to the everyday experience of anyone who uses a gas-fire. The "Oxynydor" adds the required moisture to the air. It also purifies and disinfects it, and absorbs the sulphur impurities which cause fading and tarnishing." Thanks to progress in gas-fire construction, and an ever-increasing appreciation by the public of the healthiness of gas-fires, such nonsense will by the vast majority be treated on its merits; but it is an indication of the need for broadcasting the truth regarding gas, not spasmodically, but constantly.

The heat from a gas-fire is in the form of radiant energy. It is well known that when such rays pass through a diathermanous substance they do not warm it at all; and as air is almost perfectly diathermanous, it is impossible for the radiant heat to have a drying effect on it. Indeed, it is possible to have the air in a gas-fire-heated room so cold that it cannot be endured if there is a screen between the person and the fire; whereas if the screen be removed, the fire may be so hot that one cannot sit in front of it without being scorched. It is also well known that the gas-fire is more efficient than the coal fire as a ventilator. It is a permanent "dynamic air-changer;" no less than 15 p.ct. of the thermal energy in the gas supplied being used for this purpose.

Finally, we would ask the Yorkshire Steel Company how they explain the fact that gas-fires (not fitted with "Oxynydors") are in constant use in the homes of thousands of doctors, in hospitals, and in the sick-room?

MECHANICAL EQUIPMENT IN MODERN GAS-WORKS.

Members of the South Wales Branch of the Institution of Mechanical Engineers had an opportunity of learning a good deal about the mechanical equipment of modern gas-works last Wednesday, when Mr. H. D. MADDEN, Engineer to the Cardiff Gas Light Company, gave an excellent lecture on the subject, illustrated by many lantern slides.

Mr. Madden first sketched the historical outlines of the gas industry itself, and indicated how mechanical power was gradually introduced and utilized. This he followed by a brief account of how coal gas is made, and illustrations of the early stages and progress of mechanical power for retort stoking. To-day, he said, steam, hydraulic, pneumatic, gas-engine, and electrical power afford advantages in the various sections of work. Steam-engine power is the chief, and the steam is usually produced from coke breeze with forced-draught furnaces. Coal unloading and handling plant was described, retort houses fitted with different types of stoking machinery were illustrated, and then the removal of the hot coke was explained. Naturally a good deal of attention was devoted by the lecturer to the vertical retort system. In the carbonization of coal to-day, he remarked, power is universally utilized, except in the smallest of works where, on account of the minuteness of operations, it is not economical to adopt it. By means of further slides, the audience were able to see the stages through which the gas passes, after leaving the retort-house, on its way to the distributing mains.

The lecture was followed by an exceedingly good discussion, in which a number of mechanical, electrical, and gas engineers took part. It was, however, surprising to note how little the outside engineer seems to know of the great public service the gas companies render to the community, not only in the supply of clean fuel, but also in minimizing the pollution of the atmosphere of large cities, and giving the sunshine every possible chance, to the benefit of the public health. In replying, Mr. Madden took the opportunity of driving this point home very forcibly.

A Therm Indicator.—A meter index which registers therms, as well as cubic feet, has been sent to us by Mr. A. C. Watson, of Birmingham. This particular example is for the duplicate registration of cubic feet and therms of gas of a calorific value of 450 B.Th.U. per c.ft. The inventor points out that, by its use, the saving of clerical work will be considerable.

OIL FUELS.

Production from Coal Carbonization.

In a paper at the Road Traffic Conference at the Commercial Motor Exhibition at Olympia on Tuesday, Nov. 27, Admiral Sir EDMOND J. W. SLADE, Vice-Chairman of the Anglo-Persian Oil Company, reviewed the present position of petroleum oil supplies, and indicated the most likely directions in which fresh supplies might be looked for. He said that, though research was being made to elucidate the problem of supplies of fuel oil alternative to petrol, no satisfactory solution had yet been found. There were the following three lines of attack:

1. The modification of existing known light hydrocarbons other than petrol, to suit the present internal-combustion engine, without submitting the latter to radical changes.
2. The modification of existing engines, to use liquid or other substances which are not at present employed as fuels for road and aerial transport.
3. The discovery of some entirely new method of producing mechanical power.

Of all these the most effective and promising substitute at the moment was benzole; but its production must always be limited by the demand for other derivatives of coal distillation—chiefly, coke. There was also the possibility of obtaining liquid fuel from the retorting of all coal used in this country. At present, though there were numerous retorts working, it did not seem as if the industry was yet out of the experimental stage in so far as the production of commercial motor fuel was concerned. As another possible substitute for petroleum products, there was alcohol. Here again research was busy; but, so far, success on a large commercial scale had not been achieved. The raw materials for the manufacture of alcohol on a commercial scale existed within the Empire, and it depended upon the successful prosecution of present research whether or not it became a practical proposition. It was suggested that alternative fuels might be obtained by the hydrogenation of some of the heavier hydrocarbons, such as solid naphthalene. He understood, however, that, though used in Germany, such fuels were not likely to be used alone, but only as a mixture with other materials.

Dr. W. R. ORMANDY suggested that low-temperature distillation as a means of obtaining home supplies of oil was still in the embryonic stage, and, even at the best, it was only possible to produce a few gallons of motor spirit per ton of coal distilled. The cost of the plant required for the low-temperature carbonization process was of the order of £80 per ton of coal treated per day, so that the capital cost involved in such a plant to give all the liquid fuel required would be enormous; and there was the difficulty of getting rid of the large quantity of coke made. Reference had been made in the paper to another method of obtaining oil from coal, which he thought was of greater importance. The conversion of coal into liquid products, by the action of hydrogen under high pressure and at high temperatures, was first worked out in Germany, and was so highly thought of by the Royal Dutch Oil Company that something like £400,000 had been spent in research upon it. Experimental plants were running, which converted two tons of coal into one ton of oil; and from the excess quantity of coal all the heat and hydrogen necessary for the process were produced. Such plants were running continuously; and certain groups in France, Belgium, and Luxemburg were putting down plants in their own countries, and were anxious to acquire the rights in this country also. The oil produced was in every way suitable for internal-combustion engines. During a period of twelve or fifteen years a sum of £800,000 had been spent in development in this direction; and it was work which should not be neglected in this country.

Mr. E. W. L. NICOL, Fuel Expert to the London Coke Committee, said that, far from there being a difficulty in disposing of coke, as suggested by Dr. Ormandy, the coke supply to-day was inadequate to meet the demand. Therefore, it would seem that the most important development that could be made in the immediate future was in the gas-works process. A ton of coal carbonized produced 10 cwt. of coke and 2¼ gallons of benzole. Thus, if sufficient coke were made by this process to meet the needs of steam vehicles only, there would at the same time be produced one million gallons of benzole. At present, however, the actual consumption of coke by steam vehicles was insignificant compared with electric power stations, which were among the largest users.

Gas Salesmen's Diary.—Owing to a slight delay in the printing of the "Gas Salesmen's Diary," the copies on order cannot be dispatched until after the Christmas Holidays.

Good Rating Reductions.—The Battle Gas Company recently appealed against the assessment of their undertaking; and the figures have now been finally adjusted at a reduction of 60 p.ct. in the total assessment. The hearing took place at Battle; and the Company were represented by Mr. Howard Collins. At Godalming, the Gas Company lately appealed against their assessments in the several parishes in the Godalming and Hambledon Unions. Messrs. Eve and Son acted on behalf of the Assessment Committees, and Mr. Howard Collins for the Company. The result of this appeal was a reduction of 25 p.ct. in the rateable value.

RECENT DEVELOPMENTS IN THE PRODUCTION OF TOWN GAS.

A Paper by Mr. George Evetts, M.Inst.C.E.

On Wednesday evening last, the Institution of Engineers-in-Charge, meeting at St. Bride's Institute, E.C., had placed before them by Mr. GEORGE EVETTS, M.Inst.C.E., in a lengthy paper, a great deal of valuable information in connection with "Recent Developments in the Production of Town Gas." The paper was followed by a series of about seventy lantern slides, which must have added substantially to the knowledge of many members of the audience as to the processes carried on in gas-works. In addition to the depicting of general plant, a number of the slides had reference to the new spiral-guided holder at Belfast, and others to the centrifugal pipe-casting system. There ensued a full discussion, in the course of which questions were asked that enabled Mr. Evetts to add further convincing facts to those which he had already presented.

Mr. G. W. CAREY (a Director of several gas undertakings—including the Hornsey Gas Company, whose works the members of the Institution had been invited to inspect on Saturday afternoon) occupied the chair, and, in opening the proceedings, expressed his appreciation of the compliment the Institution had paid him in asking him to preside that evening. He was deeply sensible of the value of gatherings such as this, and felt sure the subject matter of the paper would prove of great interest to them all. The name of the author was extremely well known among consulting engineers, and especially to gas companies; and from his own personal experience of Mr. Evetts's work, he was perfectly certain they would find the contents of his paper thoroughly accurate and reliable.

Mr. EVETTS (of whose paper it is possible to notice only certain portions here) began by giving some statistics relating to the gas industry. He said that at Dec. 31, 1922, there were about 8 million consumers—that is, 8 million meters in use, of which 55 p.ct. were slot consumers. There were in use more than 16 million gas cookers and fires (or, say, one cooker and one fire on the average to each consumer), and 40,000 miles of gas-mains laid. The sale of gas is about 7½ p.ct. to 8 p.ct. less than the total make, due to the gas used in the works and leakage; the total sold amounting to about 230 thousand million c.ft., or (say) 5·8 millions per mile of main. Between 28 and 30 p.ct. of the gas sold in Great Britain is sold in London and suburbs, and 35 p.ct. of the total by undertakings under municipal control. In view of the frequently expressed opinions that gas supply is a spent force, attention might be drawn to the fact that in 1900 the sale of gas was 140 thousand million c.ft., with 27,600 miles of mains. The increase is therefore nearly 80 p.ct., and the sale per mile of main has increased from 5·1 to 5·8 millions.

CALORIFIC VALUE AND COST PER THERM OF VARIOUS FUELS.

The following table gives the calorific value of various fuels, and the cost per therm of 100,000 B.Th.U. This cost must only be regarded as the prime cost of a therm used in a manner when the heating power can be developed.

—	Calorific Value.	Cost.	Cost per Therm.
	B.Th.U.		Pence.
Coal	13,000-15,000 per lb.	36s. per ton.	1·4
Coke. . . .	11,500-13,500 per lb.	30s. per ton.	1·35
Coal gas. . .	400-560 per c.ft.	10d. per therm.	10·0
Electricity . .	3,440 per unit.	2d. per unit.	58 2
Petrol . . .	19,500 per lb.	2s. per gall.	16·6
Fuel oil . . .	18,000 per lb.	£5 per ton.	3·0
Motor benzole .	19,000 per lb.	2s. per gall.	14·2
Alcohol . . .	12,000 per lb.	5s. per gall.	62·0

From this table, it is seen that a therm as coal only costs one-seventh of what it would as gas, and one-fortieth that of electricity; but in arriving at the cost of running an installation the purpose for which it is used must be taken into account, and the efficiency of utilization introduced, as well as any other advantages or disadvantages.

As a simple example, take heating a room. The coal fire has an efficiency of not more than 20 p.ct.—*i.e.*, not more than 20 p.ct. of the heat in the original coal is radiated or conducted into the room; and therefore coal actually costs 7d. per therm of heat in the room. Gas with an efficiency of 72 p.ct. would cost approximately 14d. per therm, and electricity with an efficiency of nearly 100 p.ct. would cost about 59d. Similar results would be reached with water-heating appliances; and this is one reason why coal is so popular for fires, and electricity so little used.

When considering power, the efficiencies are totally different, and a steam engine consuming 25 lbs. of steam per hour from a boiler and pipe-line installation of 60 p.ct. efficiency might be more costly than an electric motor, apart from the interest on capital cost and consideration of space. In this instance, also, the actual power cost of a gas-engine and electric motor would closely approximate.

A gas-engine running at three-quarter load would probably want 20 c.ft. of 500 B.Th.U. gas per H.P.-hour, and with gas at 8d. per therm for power the cost would be 0·8d. per H.P.-hour. This is allowing for a 25 p.ct. thermal efficiency, a figure generally exceeded. An electric motor at three-quarter load needs 1 unit for 1·25 B.H.P.-hours, or (say) 0·8 unit per H.P.-hour. Therefore, with electricity at 1d. per unit for power, the cost would be 0·8d. per B.H.P.-hour, as in the case of gas. A useful figure to keep in mind for average work, therefore, is: For equal fuel or power charges, electricity, per unit, should be one-eighth of gas per therm. The figure for the motor allows for an efficiency of over 90 p.ct. A therm is now being sold at 8d. to 9d. for domestic purposes in London and suburbs, and with power discounts of from 10 to 20 p.ct.

The following is a brief statement of the work which a therm of gas can perform:

(*a*) Supply a medium inverted burner of 45 c.p. for 75 to 78 hours.
(*b*) Supply a high-pressure gas-lamp of 500 c.p. for 20 hours.
(*c*) Supply four baths, each of 20 gallons of water, heating from 60° to 150° Fahr.
(*d*) Warm a room of dimensions 20 ft. by 16 ft. on the coldest day for 5 hours.
(*e*) Cook a dinner for two working-class families of six or seven people in each family.
(*f*) Supply a 50-H.P. gas-engine, developing 80 p.ct. of this as regular load, for 15 to 18 minutes.

GAS-WORKS AND COAL CONSERVATION.

All engineers are interested in the conservation of coal, and it is instructive to examine the results of gas-works from this point of view. In a ton of the original coal at 13,400 B.Th.U. per lb. there are 29 million thermal units, or 290 therms. The following results represent good average working for modern horizontal retorts:

In the form of gas	68 therms, or	23½ p.ct.
In the form of coke	140 ,,	48 ,,
In the form of tar	19 ,,	6 ,,
Total	227 ,,	78 ,,

It is seen, therefore, that after supplying the fuel for the works boilers and the furnaces for the carbonizing, and neglecting the value of the sulphur or sulphate of ammonia produced, the efficiency of production is 78 p.ct.

THERMAL EFFICIENCY AND COMPLETE GASIFICATION.

The vertical retort system, with steaming, produces rather less thermal efficiency, when taking the coke used for steam production into account; but the production of gas at 90 to 100 therms will result in a better financial balance-sheet. In the complete gasification system 175 therms as gas has been verified, and up to 230 therms has been claimed. If this latter figure is, in fact, proved, a thermal efficiency of nearly 80 p.ct. in gas alone will have a far-reaching effect in the future development of gas-works, particularly as this production is coupled with low operating wages and the resultant saving in wear and tear due to a simply designed plant and to reduction in the apparatus necessary for handling one-fourth of the solid fuel.

Compare the results with the electricity works, where only 7·6 p.ct. of the potential heat units in the coal is delivered to the consumer. In certain selected groups the thermal efficiency of the station up to the switch board is only 11 or 12 p.ct. Therefore, comparing the future, the gas-works promise a thermal efficiency of 75 to 80 p.ct. over-all, whereas the proposed electricity super-stations do not reckon on more than 17½ p.ct., and many experts have put this as an ideal figure.

As to the merits of gas and electricity, the gas industry feels there is room for both in certain fields, and in others either one or the other may be regarded as supreme. In fact, the gas undertakings are large users of electricity, both from their own generators and from the public supply mains. It is necessary to emphasize, however, the great desirability of combining the two methods in some manner, to avoid the wasteful process of burning raw fuel for the generation of electricity.

The matter of solid fuel handled is important; but, on the other hand, it is not the only consideration, and the question must be studied on broadest lines. General usage and over-all efficiencies of solid and gaseous fuel leaving the gas-works must be considered.

The following table shows the comparison of—

(*a*) Horizontal retort practice.
(*b*) Vertical retort practice with steaming.
(*c*) Complete gasification in one stage, with gas of 340 B.Th.U.
(*d*) Complete gasification in two stages—*i.e.*, making coke and gasifying the resultant coke in a water-gas plant.
(*e*) Low-temperature carbonization.

stem.	Solid Fuel Purchased.	Solid Fuel Handled.	Therms Sent Out from Works.			Therms Effectively Used.		
	Cwts.	Cwts.	Solid.	Gaseous.	Total.	Solid.	Gaseous.	Total.
(*a*)	20	31½	140	68	208	70	41	111
(*b*)	20	30	108	96	204	52	58	110
(*c*)	23	23	—	180	180	—	108	108
(*d*)	20	31½	—	131	131	—	78	78
(*e*)	22½	36½	196	48	244	96	29	125

In assessing the values in the above table, it is assumed that the solid fuel is used at 50 p.ct. over-all efficiency, and the gaseous at 60 p.ct.

The following table shows the amount of solid fuel purchased

and handled per 100 therms of effective service, and also the same fuel particulars per 100 therms sold:

System.	Solid Fuel per 100 Therms Sold.		Solid Fuel per 100 Therms Effective.	
	Purchased.	Handled.	Purchased.	Handled.
	Cwt.	Cwt.	Cwt.	Cwt.
(*a*) . . .	9·6	15·1	18·0	28·4
(*b*) . . .	9·8	14·7	18·2	27·3
(*c*) . . .	12·8	12·8	21·3	21·3
(*d*) . . .	15·3	24·0	25·6	40·3
(*e*) . . .	9·2	14·9	18·0	29·2

This table indicates that complete gasification offers the best solution of the solid-fuel problem in relation to the therms put to effective use by the consumer; but this does not necessarily prove that all gas undertakings would find it economically sound to instal these plants. In fact, it may conceivably be better to produce 60 therms per ton of coal than 230. The table also shows the importance of not assessing the result on the gas value alone, but taking into account the services rendered by the solid fuel sent from the works.

The Gas Regulation Act.

Mr. Evetts then proceeded to deal with what he described as the most notable milestone of recent years in the matter of gas manufacture and supply—the introduction of the Gas Regulation Act. Unfortunately, the change-over from volume to the thermal basis, he pointed out, occurred at a time which, for most of the large companies, was a period of very high prices. Thus, simultaneously with the introduction of the thermal system of charging, it became necessary to increase prices—particularly as, previous to the change, the prices charged had not been sufficient in some cases to meet costs, let alone provide a surplus for dividends. He went on to say: One practical advantage of the thermal system is that the regularity of supply has been much better maintained since its introduction. Uniformity of calorific value is essential; and the gas engineer realizes that uniformity of composition is the key to the situation. If composition is uniform, it automatically follows that calorific value is uniform. It may be possible to get two gases of equal calorific power expressed as gross B.Th.U. per c ft. but with different net values, due to differences in the percentage of hydrogen; and these gases would behave differently in an internal combustion engine. A great deal has been heard lately about the poisonous effect of carbon monoxide in town gas; but there has been very little change in the composition of gas since pre-war days. Though coal-gas poisoning forms a convenient means of committing suicide, if carbon monoxide is to be eliminated, then such things as razors and railways trains should also be eliminated.

Modern Developments.

After a consideration of the effects of the Gas Regulation Act on calorific value, the author discussed at some length the improved methods of manufacture which had led to increased thermal efficiency and reduced labour costs; consideration being given to such items as coke conveyors, coal-handling plants, charging machinery, the employment of scientific instruments, and the utilization of waste heat. The vertical retort system was then dealt with, after which attention was given to complete gasification. The gas produced by total gasification plants has a calorific value of 340 to 375 B.Th.U. per c.ft.; and the efficiency of the plant is better at the lower figure. A yield of 180 therms per ton of coal has been obtained; and it is reported that 230 therms have been reached in an experimental plant. Gas of 340 B.ThU. is not suitable for town-gas purposes; and, therefore, complete gasification is at present only auxiliary. The latest step is to combine the process with a low-temperature carbonizing plant; the latter producing gas of about 700 B.Th.U. or more. The low-temperature plant can be heated with the 340 B.Th.U. gas formed in the complete gasification unit, or by gas from a separate producer. Further industrial uses are being developed for the resultant smokeless fuel. For instance, powdered coalite has been burnt under boilers, with good thermal efficiency and economy.

Low-temperature carbonization by itself, however, is not for the moment an economical proposition for town-gas undertakings, on account of the low gas production per ton of coal and the high quality of the gas produced. This defect (when considered alone) is a virtue when the gas acts as an auxiliary, since it can be used in conjunction with a low-grade gas which might in certain circumstances be very cheaply produced.

Another probable combination is producer gas and low-temperature gas. The use of coke-oven gas for town supply is becoming much more frequent of recent years; and in the year 1922, 3636 million c.ft. were purchased by gas undertakings.

Gas-works have been among the pioneers of low-grade fuel consumption, due to the fact that they have refuse fuel for which there is practically no market. At the same time, many works have been wasteful in the use of fuel, both as to quantity and quality, merely because it happened to be available at a cheap rate. Among the developments in use of materials of construction, a lively appreciation of the virtues of reinforced concrete for certain purposes has been a feature of gas-works construction. The use of asbestos tiles or asbestos corrugated sheets for roofing and lining walls has grown rapidly; and the virtues of these materials are never more desirable than in a works where fumes from oxide sheds, liquor wells, and acid and sulphate of ammonia plants abound. Fumes and salt air are very injurious to thin gas-holder sheets; and gas engineers have recently been giving a great deal of thought to the use of wrought iron. Wrought-iron gas-holders built fifty years ago are in better condition than steel ones of half the age. Certain brands of chemically pure iron are now on the market with not more than 0·15 p.ct. total impurities. The water-proofing of concrete and the rendering of tanks acid-proof have attracted attention; and these qualities are now achieved by intermixing prepared chemicals with the cement.

With reference to pipes, the latest introduction in the manufacturing side is centrifugal casting, by which means the cost is reduced by 25 p.ct., and the tensile strength increased, as well as the test strength under water-pressure. The process of manufacture consists of rapidly revolving a frame and casing which conforms to the outer profile of the pipe. The molten metal running in is thrown by centrifugal action to the outside, and the thickness can be regulated by the amount of metal supplied to the revolving case. The casing is surrounded with a water jacket, and the pipe is later annealed. The process is applied to a concrete lining in a cast pipe, as well as a reinforced concrete pipe on a mesh base.

The introduction of various labour and fuel saving devices, together with the methods employed to distribute more gas through the same pipes, has undoubtedly had the effect of keeping the price of gas lower than it otherwise would have been. The following table shows the principal items in the cost of production of gas in London and suburbs for 1922, when the selling price was 11d. per therm, or thereabouts, contrasted with the corresponding figures for 1914; and a further column is added to show the costs at June, 1923, with gas at about 9d. per therm.

—	1914. Pence per Therm.	1922. Pence per Therm.	June, 1923. Pence per Therm.
Coal	3·00	6·10	5·00
Less residuals.	1·55	3·02	2·80
Net.	1·45	3·08	2·25
Wages and salaries; management and distribution	0·61	1·38	1·30
Repairs—works	0·74	2·45	2·20
distribution	1·16	1·85	1·70
Rates and taxes	0·42	0·65	0·65
Management and incidentals . .	0·44	0·84	0·80
Total expenditure	4·82	10·25	8·90
Total receipts	6·24	12·50	10·40
Profit for interest on loans and dividends	1·42	2·25	1·50

From this table it is seen that in June, 1923, gas was costing about 85 p.ct. more than in 1914, though the cost of coal and material is doubled on the tonnage basis, and wages per hour are also doubled. The actual selling price of gas in the three leading companies is now about 8·5d. per therm, against 5·3d. on the average in 1914—*i.e.*, an increase of 60 p.ct. Thus, the selling price is up by considerably less than the costs; and this result has only been achieved by conserving the capital, improving the working, and increasing efficiency all round.

Discussion.

The CHAIRMAN said he had been very greatly interested in the paper. At Hornsey, the members would see gas being made, under the management of Mr. J. W. Buckley, in horizontal retorts, and also in a carburetted water-gas plant. They would, he ventured to think, witness being carried out there some of the best carbonization round London.

Mr. T. COOPER, M.A., the Engineer-in-Chief to the Metropolitan Asylums Board (who is President of the Institution), remarked that his experience of gas was principally as a consumer. Formerly he had control of three small gas-works, but it had proved more economical for the Board to rely in this matter upon the big suppliers. Undoubtedly, the developments that had taken place in connection with gas during the last quarter-of-a-century had been phenomenal. It was because gas was now sold—quite fairly—by calorific value that its progress was so insistent and so great. He did not suppose there was anything to beat high-pressure gas-lamps for public lighting. Cooking and heating, too, were two enormous fields in which gas had been making gigantic strides. The gas-stove of the present day was one of the most highly scientific things to be found in a household, and there was no doubt about its great value. The domestic cooker must have been a perfect "gold mine" to the gas undertakings; but in the big kitchens of the Board, they found the coke-fired brick oven more economical for cooking on a large scale at the present time. The gas-oven obtained its heat almost entirely from convection and conduction, with very little radiation. What the gas undertakings needed, in order to compete with the coke-fired brick oven, where radiant heat was a big factor, was some form of lining for the gas-oven. One other method of utilizing gas for heating, in which the Board had made considerable extension, was in connection with laundry irons. Two years ago they had no such thing in use as a gas-heated iron; but he thought that in another twelve months or so there would be no other form than the high-pressure gas-iron in the laundries under his charge. There were in all six institution laundries, and in each one the number of articles washed was approximately 25,000 a week. He did not know the exact percentage of articles ironed; but using from six to ten gas-irons in each of five of the laundries, they did all the ironing that was

necessary for the institutions in connection with the 25,000 articles actually washed, and the figures for a quarter's gas consumption were as follows :

		C.Ft.	
Institution No. 1	Nine gas-irons, collar machine, and skirt ironer—		
	June quarter . . .	28,000	For a greater number of articles.
	September quarter .	35,100	
,, No. 2	Six gas-irons	12,700	
	Skirt and collar machine .	8,400	
,, No. 3	Six gas-irons, collar machine, and skirt ironer .	19,300	
,, No. 4	Six gas-irons, &c. . . .	22,100	
,, No. 5	Ten gas-irons, &c. . . .	29,300	

This was a very satisfactory result, which compared favourably with any other form of ironing of which he had had experience. So far as he could see, the output per worker was increased enormously. Mr. Evetts had given them a highly valuable paper.

Capt. P. SANDFORD remarked that he had been associated chiefly with the complete gasification of coal, to which reference had been made by the author. The Tully process (of which they had seen illustrations) embodied the principle of internal heating, and resulted in a considerable increase in the number of therms of gas which could be produced from a given quantity of coal. A point which he was particularly anxious to emphasize was the necessity of selling a therm of gas at 6d. This had been done in some places, and he thought in course of time the charge generally would come down to this level. There would then follow a very great increase in consumption. At the present time not half enough gas was used. It was stated in the paper that at Dec. 31, 1922, there were about 8 million consumers of gas. Reckoning a population of something over 40 millions, and five persons to a family, this would mean, roughly, that every family in the country was using gas.

Mr. EVETTS : I believe 96 p.ct. do actually consume gas.

Capt. SANDFORD (continuing) said that, as to the alleged danger of carbon monoxide poisoning, the actual risk of being killed by carbon monoxide was precisely the same as that of being killed by a bull. Alluding to the subject of gasholders, he said he had seen abroad a design of holder on the piston-and-cylinder principle. This appeared to have a great many advantages so far as the design was concerned, but he had not had any experience of the actual working of such holders. The question of whether it was better to utilize gas and coke or produce the whole of the energy in the coal in the form of gas, must depend upon local conditions. Some people did not know how valuable coke was, or they might buy it more readily.

Mr. PICKLES (West Ham Infirmary) said that, in his case, for 24 cooking ranges they had used 12 tons of coal a week, which for thirteen weeks equalled 156 tons. At £2 17s. 6d. a ton, the total cost of this coal was £448 10s. The total gas consumption for 24 cookers, over thirteen weeks, came to 594,000 c.ft., which, at 4s. 8d. per 1000 c.ft., equalled £138 12s., or an actual saving of £309 18s., or just over 68 p.ct. There was no doubt about this test, and to-day the gas consumption was even a little less.

Mr. A. T. PENN said he was paying 39s. 3d. per ton under contract for coke. The Radiant Heating Company had a system of cooking by gas which he thought would meet the point that had been raised by the President.

Mr. A. E. PENN could not see why an increased pressure was wanted, and regarded as excessive some of the pressures now prevailing. He hoped one day to see the therm at less than 6d., for he was paying only 1s. 9d. per 1000 c.ft. prior to the war.

Mr. A. W. WYATT expressed the opinion that for small users gas possessed many advantages that electricity did not offer. A constant pressure at the point of consumption was, however, necessary.

Mr. EVETTS, in reply, said he was very gratified at the reception of his paper. At Hornsey they would see a good average London works in a high state of efficiency, with no extraordinary expenditure of money to produce such excellent results. If institutions had the space for coke fires, and did not mind the dirt, coke might beat gas in price; but in the home it was a different matter. It would be seen from the Registrar General's figures of accidents that the deaths per million of the population were 15·7 from falling down stairs and 2·4 from coal gas poisoning. It was the fact that they could get such a good price for coke which enabled them to sell gas so comparatively cheaply to day. The question of pressure was a serious one, and he would advise anyone who was near the gas-works to have a governor. To get the minimum of 2 in. at the farthest end of a main (which might be 10 miles from the gas-works), it was necessary to give a pressure which might prove too high near the works. A gas company did not wish to encourage waste; for a wasteful customer meant a dissatisfied customer. It was too readily forgotten that the gas companies had maintained a supply of gas throughout the great coal strike, utterly regardless of the cost to themselves of doing so. It cost enormous sums to do this; and when they were faced with these losses at the end of that troublous period, the matter had to be taken into consideration. The companies did not count the cost while their commodity was so badly needed, but they had to do so afterwards, and unfortunately it synchronized with the introduction of the therm.

The Mechanical World Year-Book.—From Messrs. Emmott & Co., Ltd., No. 65, King Street, Manchester, we have received a copy of this useful publication for 1924. In the new edition of this popular handbook, a lengthy section on the combustion of fuel forms a prominent feature. Notes and data are given on the composition and properties of air, air required for combustion, weights and volumes of air and products of combustion, calorific values of fuels, &c. A new section on the strength of flat plates embodies a concise summary of the various rules for the strength of rectangular, square, and circular plates, both *encastré* and simply supported, and includes the results of the more recent investigations. In the body of the work, various revisions have been effected; while a number of new illustrations has been introduced. The price of the present issue is 1s. 6d. net.

SCOTTISH JUNIOR GAS ASSOCIATION.

(EASTERN DISTRICT.)

Visit to the Works of Messrs. Alder and Mackay, Ltd.

The members of the Eastern District of the Scottish Junior Gas Association paid a visit on the afternoon of Saturday, the 8th inst., to the works at Gorgie of the well-known meter-manufacturing firm, Messrs. Alder and Mackay, Ltd. A company of about fifty took part in a distinctly educative visit.

The present works were built in the year 1890, from designs of the late Mr. John H. Bennet, and extensions which are nearing completion were necessitated by the continued expansion of the business. Apart from the ordinary wet and dry meters which form the bulk of the manufacture, the Company have had the advantage of producing several specialities—such as the cast-iron cased dry meter (of which they are the original makers under the patent of 1864), Green's patent underground wet meters for outdoor purposes, the "A. & M." patent pressure-wave controller for public gas lighting, hurricane-proof copper street gas lanterns, wet and dry test meters, and complete testing plant, embodying standard holders, all in accordance with the Sales of Gas Act, 1920.

The first impressions formed by the visitor, immediately he begins to move round the works, are the thorough and practical manner in which each department is laid out, and the cleanliness of the whole factory. In the various tinsmiths' shops, one is able to see the dry meters being made up from the foundation until they reach the finishing shop. Through the various departments, an opportunity is afforded for seeing some specially constructed machines and tools. There are in the drilling shop various types of vertical drilling machines used in connection with the manufacture of cast-iron dry meters; in the brass-moulding shop, power and hand-press moulding machines are in use, together with a 600-lb. tilting gas-furnace and a 400-lb. tilting coke furnace; in the brass-finishing departments are various types of capstan lathes; and in the index departments, wire feed lathes. In the engineering department there are several power presses for stamping work, and also drawing presses for the manufacture of pressure-wave controllers and the new standard meters. Several Browne & Sharpe full automatic lathes are employed for the manufacture of small brass parts; while the smith is independent, using the Blacker mechanical hammer.

After leaving the departments enumerated, throughout which appliances are used for testing the meters in their different stages, one passes forward into the painting shop, where "Aerostyle" spraying machines are used; and in the packing department is an overhead runway for lifting the boxes direct on to the railway lorries. A "goods received" department, with ample accommodation, is also provided for unpacking cases, emptying motor wagons, and recording and washing meters received for repairs before they pass forward to the several workshops. The whole factory is lighted by means of Keith-Blackman high-pressure 60-c.p. lamps, and fitted with Mather and Platt "Grinnell" sprinklers for use in the event of fire.

After the inspection, the members were entertained at tea in Messrs. Ferguson and Forrester's Restaurant, Princes Street, when Mr. D. D. Bruce (East Wemyss), the President, thanked the Directors of Messrs. Alder and Mackay for their kindness in affording the members the opportunity of visiting the works, and for their hospitality in providing tea. Mr. Bruce, in the course of his remarks, mentioned that he felt he was voicing the feeling of the members in saying that the New Grange Works were almost perfect. Mr. J. L. Bennet, who occupied the chair, in returning thanks on behalf of the Board of Directors, said they were very glad indeed to have the opportunity of meeting the junior members of the profession, and to find that their visit had been so interesting, in affording knowledge upon the subject of meter making. Mr. Bennet, in alluding to the remarks of the President, pointed out that it was always the ideal of the Company to keep ahead of the times, as regards both the factory and their manufactures. The present extensions were due to the continued growth of the business.

The Minister of Health and the Secretary for Scotland have appointed a Committee, with Mr. Edward Shortt as Chairman, to inquire into the present law and practice regarding the rating of machinery and plant in England and Scotland respectively, to make recommendations as to alterations which are desirable and practicable, having regard to the considerations involved, with a view to removing inequalities, and, if possible, assimilating the law and practice of the two countries, and to make definite proposals thereon.

Congratulations to the "Co-Partnership Journal" of the South Metropolitan Gas Company, which has now completed its twentieth volume, the first number having been published at Christmas, 1903. Though this bright little magazine — the pioneer of gas employee publications in Great Britain—has been among us for twenty years, it has lost nothing of its freshness. May it, in the continuance of its useful functions, enjoy perpetual youth, and Mr. Walter T. Layton long life to carry on his good work as Editor.

NOTES ON HEAT TRANSMISSION.

By D. M'KERRACHER, B.Sc., A.R.T.C.

[A Paper read before the Western District of the Scottish Junior Gas Association on Dec. 8.]

The gas industry in all its phases has a keen interest in the subject of heat transmission. From the period of carbonization to the time when the gas is consumed at some distant quarter, there is an extended number of processes which are all concerned with the transference of heat. The retort-house itself generally entails a host of auxiliaries which also present problems in heat transmission. The present paper is not intended to be a report of special work done in an endeavour to tackle any specific problem applying to the gas industry, but has been prepared with the idea of laying before you some of the knowledge which has been gained with regard to heat transmission, and to state the general principles underlying its mechanism.

At present it is generally accepted that there are three methods by which heat may be transmitted from one point to another—namely, conduction, convection, and radiation; but before giving the physical definition of each of these three methods, it will perhaps be advisable to state clearly our conception of what heat is. This leads us to review shortly the kinetic theory regarding the structure of matter. According to this theory all matter is supposed to consist of very small particles termed molecules. The dimensions of these are approximately of the order of 10^{-8}. The molecules are not at rest, but are constantly moving to and fro in all directions at very high speeds (over 1000 miles per hour). In the case of solids, they are vibrating about mean positions, and have a definite range of oscillation, which need not be uniform, but which is comparable with molecular dimensions. While the molecules have varying ranges of motion, they are, except in the case of gases, bound together by strong molecular forces, termed forces of cohesion, which, of course, are only evident within distances which may be equal to ten or more diameters (of the molecule). The varying magnitude of these forces largely determines the nature of a body as regards its physical state. In the solid the forces of cohesion are strong, and the range of motion of the particles is limited. In the liquid the forces are very much weaker, giving a larger range of motion to the molecule, and permitting the molecules to diffuse slowly from one position to the other. In a gas there are practically no forces of cohesion, with the consequence that the path of the molecules is much increased (perhaps as much as one-hundredth of a hairbreadth), and is limited practically by the frequency of the collisions with neighbouring molecules. The speed of molecular diffusion is thus comparatively great in gases.

Since the molecules of a body are continually in motion, in virtue of its mass and velocity, each molecule will possess a certain amount of kinetic energy, which may be increased or decreased on collision with neighbouring molecules, but which ultimately balances up in the whole, giving in all bodies a quantity of molecular energy of uniform value over equal volumes of the body when at uniform temperature. This vibrational energy of the molecules is termed heat; and an increased quantity of heat means an increase in the molecular energy, which, since the mass of the molecules is constant, means a higher speed of vibration, with a tendency to extended ranges of motion. Of course, all the heat does not increase the vibrational energy, for (in the case of liquids and solids) part adds to the potential energy. This portion may be regarded in a sense as latent.

Proceeding now to discuss the three modes of transmission, let us consider first of all that of conduction. When a metal rod is heated at one end, then the other end of the rod becomes heated to a certain degree also. At first, the temperatures at all points along the bar gradually increase till they arrive at a stationary value. This stationary state does not signify that there is no flow of heat along the bar, but shows that the surrounding air (or other medium) is carrying off (by convection and radiation) as much heat as is being supplied. By what means is the heat being carried from one end to the other? On applying heat to one end of the rod, the vibrational energy of the molecules at that end is greatly increased, and these molecules, coming into collision with their neighbours, or being connected to neighbours by strong forces of cohesion, impart to them a portion of their augmented energy. This sharing of energy goes on throughout the length of the bar, so we may regard conduction of heat as being the diffusion of the kinetic energy of the molecules throughout a body. In the conduction process there is no diffusion of the molecules, and the rate of transmission is naturally slow.

When the steady state has been obtained—*i.e.*, when the heat flowing into a wall of the material through one face is equal to that flowing out of the other, none being absorbed or given up by the intervening material—it is shown by experiment that the quantity of heat passing through the wall is directly proportional to the area (A), time (t), and temperature difference between the faces ($T_2 - T_1$), and inversely proportional to the thickness (x). Expressing these terms in symbols,

$$Q = K.\,A.\,t.\,\frac{T_2 - T_1}{x} \text{ or } K.\,A.\,t.\,\frac{dt.}{dx.}$$

where Q = quantity of heat.
K = thermal conductivity of the material.
$\frac{T_2 - T_1}{x}$ or $\frac{dt}{dx}$ = temperature gradient.

References so far have been to solids; but conduction also takes place in liquids and gases. Generally, however, the amount so transmitted is rendered negligible by that due to other means.

With gases, the conductivity depends greatly on viscosity, and may be calculated from molecular data. [$K = U.S_v$, where U = coefficient of viscosity, and S_v = specific heat of gas at constant volume.] Since the viscosity increases rapidly with temperature, it follows that the conductivity of a gas increases with temperature, and in the case of solids there is no doubt that the conductivity is also a function of the temperature. Homogeneous solids generally show a decrease, and granular materials an increase, in conductivity with rise of temperature.

In convection the transfer of heat is made by the actual motion of the particles of matter, and pertains practically to liquids and gases. Whenever relative motion of the particles takes place and sets up a temperature gradient in the material, then convection occurs. This may be either natural or forced. Natural convection occurs when a fluid is heated from below. The particles in the lower layers are heated first; they expand, and suffer in consequence a decrease in density, causing the particles to rise through the body of the fluid, to be replaced by the colder and heavier particles. In passing upwards the hot particles no doubt transmit a portion of their energy to the colder ones by conduction. Natural convection is thus a simple gravity effect. A hot object cooling in a still atmosphere is another illustration of natural convection. Forced convection is due to outside causes which set up currents which may modify or obscure altogether the natural effects.

In practice it is seldom, if ever, that one mode of transmission only is involved. Generally, all three methods of heat transmission play their parts, though one method may be predominant. Consider the case of transmission of heat from a gas at high temperature through a metal plate to water—*i.e.*, the general condition which holds in any type of boiler.

Assume for a moment, neglecting any radiation, that the gas temperature is 1500° Fahr. and the water temperature 350° Fahr. (a boiler working at 120 lbs. per sq. in.). Consider the metal temperatures to be equal to the gas and water temperatures, and simple conduction to be the method of transmission. Then, taking the thermal conductivity of an iron or steel plate as 0·115 C.G.S. units, or 334 B.Th.U. per sq. ft. per hour per inch thickness per degree Fahr., and a plate thickness of $\frac{1}{2}$ in., for steady conditions, the quantity of heat transmitted per hour per sq. ft. of heating surface would be 768,000 B.Th.U. This means that the evaporation from and at 350° Fahr. (latent heat 870 B.Th.U.) would be 883 lbs. per hour per sq ft. of surface, which, of course, is ridiculous; the actual value ranging from 4 to 10 lbs. per hour.

The reason for the failure of the simple conduction theory is that the metal temperatures are nothing like those of the gas and water due to the forces of cohesion between the metal and the gas; a film of gas is bound to the surface of the metal, and the heat is transmitted through this stagnant film by conduction. All gases are bad conductors of heat; and consequently, across the film thickness is a large temperature drop. (A similar water film is formed on the other side.) The film is usually considered to be at rest. If it is in motion, this will be slow, fluid slipping on fluid, the layer in contact with the metal itself having no motion relative to the plate. Conduction of the heat through the layer will, therefore, still predominate. The fluids on either side of the metal are in motion; and the nature of this motion requires consideration. There are two types of fluid flow—steady laminar, or streamline, flow, and turbulent, or eddy, flow; the velocity at the change from the steady state to the turbulent state, or *vice versâ*, being termed the critical velocity. This is a function of the viscosity and density of the fluid, and the dimensions of the channel of flow. Below this value the passage of heat from the gas to the metal will be chiefly by conduction through the layer, possibly by natural convection. The rate of heat transmission will be slow.

If, however, the speeds of flow are high, and well above the critical velocity, the body of the gas is in a state of turbulence; and many more hot molecules of the gas are brought into contact with the slow moving film, giving up in the process a portion of their energy. The more rapidly the hot molecules are brought into contact with the surface, and then cast into the body of the gas again, the greater will be the rate of transmission of heat, which is now largely dependent on forced convection.

Osborne Reynolds was the first to put these ideas into operation, and he expressed them in the form of a law—

$$H = (A + BS_v)\,t$$

where
H = heat transmitted per unit area.
A and B are constants depending on the nature of the fluid and the surface of the metal.
S = density of the fluid.
v = velocity of flow.
t = temperature difference between the fluid and the metal.

The law holds for fluids in general. Much experimental work has been done to verify this; the results generally being expressed in a form suitable and convenient for the engineer.

Heat losses or transmissions by natural convection are not without interest to those in the gas industry; and in this field also work has been done. The heat loss from a hot surface to a gas is proportional to the 1·25th power of the temperature differ-

ence between the surface and the gas, and to the 0·45th power of the pressure—that is,

$$h = C\, p^{0\cdot45}\, \theta^{1\cdot25}$$

where h is the heat loss per unit area.

Compared with cases of forced convection, the transmissions are, of course, very small. With such conditions the position of the surface has also some bearing on the rate of transmission, for a horizontal surface will give a larger transmission than a vertical surface for the same temperature difference.

RADIATION.

Heat from the sun, a gas-fire, or a high-temperature electric radiator is transmitted by radiation. Whenever a body is at a high temperature, the particles are vibrating at high speeds, and these vibrations are transmitted in some way to the surrounding ether, thus setting up a series of periodic disturbances or waves. The frequency of the vibrations is not by any means uniform, as it varies over a wide range, giving waves of light, or heat, according to the magnitude of the frequency. The velocity of propagation of the waves in whatever form is constant, and is equal to the velocity with which light travels—namely, 186,000 miles per second. The transmission of radiant energy does not depend on the presence of matter, as the waves can travel through perfect vacua.

The heat of a warm body is transmitted as radiant energy through the intervening medium, which, if wholly transparent, appears to be totally unaffected; and on reaching the colder body, this radiant energy is absorbed, and reappears as heat. This process of radiation and absorption is going on continuously at all temperatures, high or low; and a steady temperature in a body merely indicates that it is absorbing just as much energy as it is radiating. If an enclosure impervious to heat contains several bodies, the hot bodies radiate to the cold until equilibrium is obtained. At this stage the process does not cease, as the simultaneous radiation and absorption gives continual interchange of energy between the bodies while the energy of each remains constant.

The radiation from a body depends largely on its constitution, surface condition, and temperature; while absorption, affected also by these conditions, depends at the same time on the condition of neighbouring bodies. In general, good radiators are also good absorbers; and it is found that black bodies are the best radiators and absorbers, and highly polished bodies and transparent bodies the poorest. The latter type form excellent reflectors. Reference has been made to the term "black body" or "full radiator;" and this is defined as a body which is not in the least transparent, which has no power of reflection, but absorbs all the incident radiation of whatever wave length at all temperatures.

It is not easy to obtain the full radiator, but it has been shown (Balfour, Stewart, and Kirchhoff, 1838) that the radiation from within an opaque enclosure at uniform temperature meets black-body conditions, and the radiation from a small hole in such an enclosure approximates closely to full radiation. Consequently, muffle furnaces and heating chambers in industry may be considered as giving full "black body" conditions. A sooted surface or a bed of incandescent coal radiates and absorbs as a black body; but metallic surfaces, &c., depart to a great extent from these conditions, the radiation in such cases being only a fraction of what it would be for a black body. Gases also are bad radiators; the radiation from a bunsen flame being only about 7 p.ct. of that from a black body at the same temperature, and that for a luminous flame in the bunsen about 12·4 p.ct. There are certain bodies—*e.g.*, rock salt—which transmit completely (over 90 p.ct.) all incident radiation which falls upon them. Such bodies are termed transparent. There are other bodies, however, which, while transmitting the radiations, only permit certain lengths of waves to pass through and absorb the others. These bodies exhibit what is termed selective absorption. In the case of gases, carbon dioxide and aqueous vapour absorb a large percentage of the radiation. Incidentally, it has been shown that the radiation from a bunsen flame—and probably from the products of any form of combustion—is almost completely due to the carbon dioxide and water vapour molecules formed; consideration of the nature of the gases before combustion being unnecessary.

There are several laws connected with radiation; but, in dealing with heat transmission problems, chief use is made of the Stefan-Boltzman law. This refers to complete black-body radiations, and can only be used where such conditions are practically achieved. According to this law, the total radiation is proportional to the fourth power of the absolute temperature of the body. Thus, if T be the temperature of the hot body, and T_0 that of the surrounding cold envelope, the energy transmitted is

$$E = 5{\cdot}72 \times 10^{-5} (T^4 - T_0^4) \text{ ergs per sq. cm. per second,}$$

which, on being transferred to heat units, gives, if the temperatures are in degrees Fahr.,

$$E = 17{\cdot}2 \times 10^{-10} (T^4 - T_0^4) \text{ B.Th.U. per sq. ft. per hour.}$$

In dealing with the emissivity from a surface which does not fulfil black-body conditions, a coefficient, termed the emissivity constant (C), for the surface at the temperature T must be introduced. The expression then becomes $E = C + D (T^4 - T_0^4)$; D ($=5{\cdot}72 \times 10^{-5}$, or $17{\cdot}2 \times 10^{-10}$) being the black-body constant. This latter expression is of importance when temperatures of surfaces are being measured by means of a radiation pyrometer which has been calibrated for black-body radiations. It is necessary to accept with caution many temperatures which are recorded without proper care.

The retort presents complicated conditions, though it is generally known that pressure, final temperature of mass, rate of transmission of heat, time to reach final temperature, &c., are definite factors which influence the carbonization results. Chemical knowledge also needs to be brought to bear on such a problem; but each of these factors is closely related to, and governs to some extent, the heat transmission through the walls. The specific heat of coal in its stages from coal to coke, the preheating of the secondary air for combustion, and condensation, are all problems connected with heat transmission.

THE "MACDONALD" PORTABLE GAS ANALYSIS APPARATUS.

By D. MACKENZIE MACDONALD.

[Notice was given of the new gas-analysis apparatus, of which the following article is an amplified description written by the inventor, in the issue of the "JOURNAL" for Aug. 29 (p. 636). It embodies two main features—the minimization of capillary errors, and an explosion method for the determination of carbon monoxide. All gas analysts appreciate the difficulty and tedium of absorption methods for the evaluation of this constituent, and will find much of interest in the following account of the new apparatus. There is, however, always a chance of error in explosion methods; only a very small amount of gas can be taken, and there is the possibility of the production of minute—but, on the amount of sample taken, appreciable—quantities of oxides of nitrogen. Consequently, any error incurred will, with the system outlined below, affect three, instead of two, constituents of the gas. It will be noted also that an accurate measure of the oxygen used in the explosion is of prime importance, and that the amount taken is arrived at by calculation, on the assumption that the air contains 20·9 p.ct. It is questionable whether this is sufficiently accurate as regards atmospheric conditions in the laboratory; for, when numerous bunsen burners are in simultaneous use, the carbon dioxide content is often far from normal. Should this, for example, amount to 0·5 p.ct., the results of analysis will be vitiated to a considerable extent. As a purely minor point, it might be contended that the complicated calculation of results would in itself impose a certain hazard, for gas-analysis of this nature is not invariably entrusted to manipulators possessed of elastic minds.—ED. "G. J."]

The apparatus described below has been patented (patent No. 201,408), and the sole rights of manufacture and sale are in the hands of Messrs. Townson and Mercer, No. 34, Camomile Street, E.C., who hope to have it on the market at an early date. It includes three absorption pipettes, one explosion vessel, one burette, two levelling bottles, a spark-coil and accumulator, and a branched capillary, and is assembled in a wooden case. Being entirely self-contained, it can be moved from place to place, as required. Though portable, the apparatus will do a complete technical analysis of coal gas, water or oil gas, town gas, or similar combustible gases.

The capillary is of very fine bore, and has seven branches in addition to the two ends, which are open to the atmosphere. The centre branch is connected to the top of the burette, the central position of which, by halving the possible error due to capillary space, is conducive to greater accuracy. In this, as in the other connections, the two ends are ground together and fit tightly, being held in place by rubber tubing. There are two absorption pipettes connected to the two branches immediately on the right of the burette, and a third one connected to the branch immediately on the left. The branch next to the left is connected to an explosion vessel filled with mercury. The two outermost branches are the third ways of two three-way taps.

The burette is graduated from the top. The bulb holds 70 c.c. graduated in ½ c.c., and the stem is graduated in 20ths of a c.c., and holds 50 c.c., making a total of 120 c.c. The bottom of the burette is connected to the water levelling bottle, which contains acidified gas-saturated water. The CO_2, C_nH_m, and O_2 are absorbed by the reagents in the various pipettes; and the CO, CH_4, and H_2 are simultaneously exploded over mercury. The N_2 is determined directly by actual measurement.

The very fine bore of the capillary is to avoid errors due to the volume of the capillary; and these possible errors are still further reduced by the central position of the burette, which halves the capillary space. This half is determined in each apparatus once for all in the following manner: Pass a little water into the explosion vessel, so that it is filled to the level of the main capillary.

Then draw air into the burette so that it and the capillary are full to below the bulb. Measure the exact volume. Now draw water back from the explosion vessel to the zero mark in the top of the burette and read the volume of air again. The difference between the two readings is the volume of half the capillary, and is to be added to the volume of gas taken for analysis, and to the volume of air taken for explosion. This correction will be of the order of 0·1 or 0·2 c.c.

The reagents should always be left with 2 or 3 c.c. of gas above them in the pipettes, so as to avoid the sticking of taps. When ready for an analysis, the reagents are drawn up to the level of their respective taps, as also is the mercury in the explosion vessel. The gas is passed out, and the capillary flushed out in both directions with water from the burette. About 30 c.c. of the sample is drawn in from the right-hand end. If the sample is in a sample-tube, it is supported in the bracket and forced out by passing water in from below. The first 30 c.c. is discarded through the left end of the capillary, leaving the latter full of gas. About 110 c.c. is now drawn in and measured exactly*; the correction for the capillary being added to give the volume taken for analysis.

The gas is now passed two or three times to the KOH pipette, and again measured; the difference in volume being the volume of CO_2 absorbed, which must be reduced to percentage, since the sample taken is more than 100 c.c. Similarly, the gas is next passed several times to the fuming acid pipette. Before measuring, the acid fumes must, of course, be absorbed by passing twice to the KOH pipette. The difference in volume this time is unsaturated hydrocarbons, and must be reduced to percentage as before. Thirdly, the O_2 is determined by passing several times to the pyrogallol pipette. The residual volume after the oxygen determination is carefully noted, as it forms the basis for the explosion. About 24 c.c. of this volume in the case of coal gas, or a proportional amount in the case of other gases, is passed to the explosion vessel; the exact amount being carefully measured by difference. The rest of the residue is either discarded or stored in the fuming acid pipette for a second explosion, if desired. The capillary is flushed out with water from the burette in both directions, so as to leave it full of water. Then 120 c.c. of air is drawn in, and passed twice to the KOH pipette, to remove any trace of CO_2 present. The volume is then exactly measured, and the correction for the capillary added. The air is now passed to the explosion vessel, and the mixture of air and gas passed two or three times back and forth between the explosion vessel and the burette, to ensure thorough mixing. Finally, all is passed over to the explosion vessel, and the capillary swept out by water to below the tap of the explosion vessel. The gas is then exploded; and if it is well mixed, and in the correct proportions, the explosion should be so slow that the travel of the flame will be almost visible to the naked eye.

After allowing a few minutes for cooling, the gas is passed back to the burette, and is accurately measured; the capillary being left full of gas, to agree with the other measurements The contraction is noted, and the CO_2 formed in the explosion is next determined by passing the gas back and forth to the KOH pipette until there is no further absorption; a note being kept of the CO_2 absorbed. The O_2 left is similarly determined in the pyrogallol pipette, and the final volume of the gas is observed.

The following facts are now known:

(1) The O_2 used (= O_2 taken as air *minus* O_2 left).
(2) The contraction on explosion.
(3) The CO_2 formed in the explosion.
(4) The volume of residue left after the explosion.

The following reactions have taken place:

(1) $2CO + O_2 = 2CO_2$ (*i.e.*, 3 volumes contract to 2 volumes.)
Therefore contraction = 1 volume = O_2 used = half the CO present.

(2) $2H_2 + O_2 = 2H_2O$ (disappears).
Therefore contraction = 3 volumes = 3/2 H_2 present = 3 times O_2 used; and O_2 used = half H_2 present.

(3) $CH_4 + 2O_2 = CO_2 + H_2O$ (disappears).
Therefore contraction = 2 volumes = O_2 used = twice CH_4 present.

Therefore:

A. Contraction = $\frac{1}{2}CO + 3/2\ H_2 + 2CH_4$.
B. CO_2 formed = $CO + CH_4$.
C. O_2 taken − O_2 left = O_2 used.
D. O_2 used = $\frac{1}{2}CO + \frac{1}{2}H_2 + 2CH_4$.

From these equations the following can be deduced:

E. H_2 = contraction *minus* O_2 used = equation A *minus* equation D.
F. Contraction *minus* $2CO_2$ formed = 3/2 H_2 − 3/2 CO = equation A *minus* twice equation B.
G. (2) contraction − $4CO_2$ = 3 H_2 − 3CO (twice equation F).
H. (3) contraction − $3O_2$ used = $3H_2$ (3 times equation E).
I. Contraction + $4CO_2$ − $3O_2$ used = 3CO (equation H *minus* equation G).

$$\text{Therefore CO} = \frac{\text{contraction} + 4CO_2}{3} - O_2 \text{ used}$$

J. CH_4 = CO_2 formed − $\frac{CO}{3}$ = equation B *minus* CO found.

The nitrogen is determined by direct measurement in the following manner: From the final residue, which is all nitrogen, is substracted the nitrogen added as air—*i.e.*. 79·1 p.ct. of the air taken. The remainder is the nitrogen in the volume of gas taken for explosion. The proportions of CO, H_2, CH_4, and N_2 in the volume of gas taken for explosion are now known; and to reduce to the volumes present in the original sample, each figure is divided by the amount taken for explosion, and multiplied by the residue after the absorptions. The resulting figures are based on whatever volume of gas was taken, and must be reduced to percentage by dividing by this volume and multiplying by 100.

It is simpler to work out a factor by filling-in the values in the following fraction, and multiplying by it the amounts of CO, CH_4, H_2, and N_2 found in the volume taken for explosion,

Let R = residue after absorptions.
„ E = amount taken for explosion.
„ A = „ „ „ original analysis.

$$\text{Then the factor} = \frac{R \times 100}{E \times A}$$

The writer has tested the residue from the explosion for CO by the blood test, and found no trace. He has also done analyses against a Bunte burette for absorptions, and against the "Metrogas" apparatus for nitrogen, and has had good checks.

As the nitrogen is determined directly, the sum of the constituents will not be 100, but will afford a check on accuracy by the nearness to 100 which is obtained. The directions must be followed exactly; and in fitting the apparatus together it is most important to make sure that the joint of capillary and pipettes is close, leaving no gas space.

EXAMPLE.

SAMPLE OF CRUDE COAL GAS.

Four litres were collected in an aspirator bottle, and the analysis was done in duplicate:

	(1) C.C.	Vol.	P.Ct.	(2) C.C.	Vol.	P.Ct.
Gas taken	109·90			110·00		
Corrections for capillary	0·20			0·20		
Reading	109·70			109·80		
Pass to KOH pipette.		4·05	3·68		4 05	3 68
Reading	105·65			105·75		
Pass to fuming acid		3·60	3·27		3·50	3·18
Reading	102·05			102·25		
Pass to pyrogallol pipette		0·50	0·44		0·50	0·44
Reading = residue	101·55			101·75		
Pass to explosion vessel					Rest passed out	
Reading	77·65			77·75		
Gas taken for explosion.	23·90			24·00		
Air „ „ „	119·55	(= 24·99 O_2)		120·00	(=25·08 O_2)	
Total „ „ „	143·45			144·00		
Explosion reading	111·35			111·75		
Contraction		32·10			32·25	
Pass to KOH reading	102 85			103 10		
CO_2 formed		8·50			8 65	
Pass to pyrogallol reading	97·80			98 15		
Oxygen left		5 05			4 95	
		(1)			(2)	
O_2 used = O_2 taken *minus* O_2 left =		24·99			25·08	
		5·05			4·95	
		19·94			20·13	
Contraction =		32·10			32·25	
CO_2 formed =		8 50			8·65	
O_2 used =		19·94			20 13	
Final residue =		97·80			98·15	

CALCULATIONS.

Carbon Monoxide.

$$CO = \frac{\text{contraction} + 4\ (CO_2)}{3} - O_2 \text{ used.}$$

(1)	(2)
$= \frac{32·10 + 4\ (8·50)}{3} - 19\ 94$	$= \frac{32·25 + 4\ (8·65)}{3} - 20·13$
$= \frac{32·10 + 34·00}{3} - 19\ 94$	$= \frac{32·25 + 34·60}{3} - 20·13$
$= \frac{66·10}{3} - 19·94$	$= \frac{66·85}{3} - 20·13$
= 22·03 − 19 94	= 22 28 − 20·13
= 2·09	= 2·15

Methane.

CH_4 = CO_2 formed *minus* CO found.

(1)	(2)
= 8·50 − 2·09 = 6·41	= 8·65 − 2·15 = 6·50

Hydrogen.

H_2 = contraction *minus* O_2 used.

(1)	(2)
= 32 10 − 19·94 = 12·16	= 32·25 − 20 13 = 12·12

Nitrogen.

N_2 = Final residue *minus* N_2 added as air.

(1)	(2)
= 97·80 − (119·55 − 24·99)	= 98·15 − (120·00 − 25·08)
= 97·80 − 94·56 = 3 24	= 98·15 − 94·92 = 3·23

Factors.

(1)	(2)
$\frac{101·55 \times 100}{23·90 \times 109·90}$ = 3·866 = factor to reduce to percentage.	$\frac{101·75 \times 100}{24·00 \times 110·00}$ = 3·854 = factor to reduce to percentage.

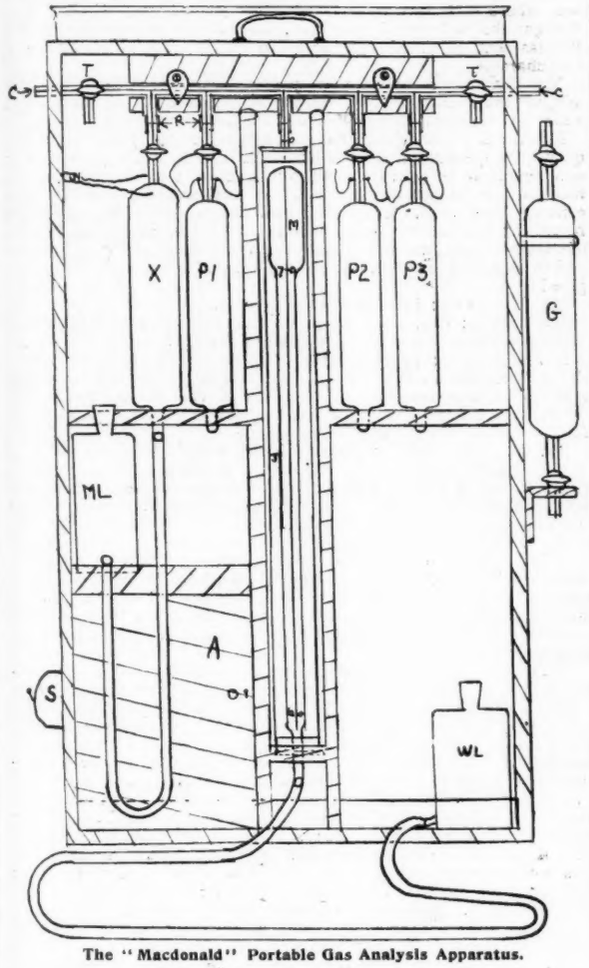
(1) P.Ct.	(2)
2·09 × 3·866 = 8·27 CO	2·15 × 3·854 = 8·29 CO
6·41 × 3·866 = 24·78 CH_4	6·50 × 3·854 = 25·05 CH_4
12·16 × 3·866 = 47·01 H_2	12·12 × 3·854 = 46·71 H_2
3 24 × 3·866 = 12·52 N_2	3·25 × 3·854 = 12·45 N_2

* In this and all other readings, about one minute, or a little more, should be allowed for the burette to drain; and this time must always be the same.

Summary.

	(1) P.Ct.		(2) P.Ct.
CO_2	3·68*	..	3·68*
C_nH_m	3·27	..	3·18
O_2	0·44	..	0·44
CO	8·27	..	8·29
CH_4	24·78	..	25·05
H_2	47·01	..	46·71
N_2	12·52	..	12·45
Total	99·77	..	99·80

* The sample being one of crude coal gas, the CO_2 figure includes also H_2S, which makes it rather higher than it would otherwise have been.



The "Macdonald" Portable Gas Analysis Apparatus.

C.—Capillary.
T.—Three-way taps.
P1.—KOH pipette.
P2.—Pyrogallol pipette.
P3.—Fuming acid pipette.
X.—Explosion vessel.
A.—Accumulator cupboard.
M.—Measuring burette.
J.—Water jacket.
G.—Gas sampling tube in position.
ML.—Mercury levelling bottle.
WL.—Water levelling bottle.
S.—Electric switch.
R.—Rubber joints.

Range Boilers Standardized.

The "American Gas Journal" says that manufacturers of range boilers in the United States have discarded more than a hundred miscellaneous types of boilers, and have adopted new standard sizes which will result in a direct saving of $5,500,000 a year to the public, according to a statement issued recently by the American Gas Association. The new standards were adopted for immediate practice by makers representing 90 p.ct. of the total tonnage of range boilers. July 1 next is the time-limit set when the standards must be completely effective. The first result of this revolutionary standardization work will be to reduce the cost of installing and connecting a coal or gas water-heater to the range boiler. The standard boiler sizes and tappings make it possible for the plumbers and gas companies to cut the pipe in their own shops, instead of on the consumers' premises, and to complete the entire job in about one-half the time formerly required, thus ensuring a direct saving to the consumer on every boiler placed in service. It is confidently anticipated that the effect of these standards on the gas industry will be to stimulate the sale of gas water-heaters, and consequently to increase the sales of gas. The American people are now using three times as much gas as they did twenty years ago, and double the amount consumed ten years ago.

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

Short Paper Evening.

One of the popular "short paper" evenings of the Association took place last Friday evening, at the Westminster Technical Institute, S.W., when three ten-minute papers on distribution topics were read and discussed—the speakers being subjected to a time limit which was rigidly enforced. The chair was occupied by Mr. WALTER GROGONO (Gas Light and Coke Company), the President of the Association.

The authors and titles of the papers were as follows:

Mr. SAMUEL B. CHANDLER (Tottenham District Light, Heat, and Power Company)—"Notes on Domestic Hot-Water Supply."

Mr. E. L. OUGHTON (South Suburban Gas Company)—"Notes on Waste in the Distribution Department."

Mr. W. L. WESTBROOK (North Middlesex Gas Company)—"Gas Sales and Builders' Business."

The papers, with summarized reports of the discussions to which they gave rise, follow.

The PRESIDENT, in bringing the proceedings to a conclusion, remarked upon the great value of contributions such as those to which they had just listened.

Mr. F. E. WOODFINE (South Suburban Gas Company) proposed a hearty vote of thanks to the authors, which was seconded by Mr. A. H. STAINER (Brentford), and acknowledged by Mr. CHANDLER.

DEATH OF A PATRON.

The PRESIDENT, before the first paper was presented, said he regretted to have to announce that one of their patrons, Mr. W. H. Y. Webber, had passed away, and he was sure that those present would wish to show their sympathy with the relatives.

This the members did by rising silently in their places.

NOTES ON DOMESTIC HOT WATER SUPPLY.

By SAMUEL B. CHANDLER, A.M.I.Mech.E.

An important feature of gas supply is its application to the heating of water for domestic purposes; and some progress is being made in this direction. Of the numerous services rendered by gas in adding to comfort in the average household, this special application occupies a high place; but progress is necessarily slow, due primarily to the comparatively high prices of gas ruling at present. Though its popularity is on the increase, no startling advance seems likely until costs come down to pre-war level.

Prior to the war the subject was receiving great attention by gas sales departments, and was regarded as an important outlet for the sale of gas. The past few years have been marked by improvements in the design, thermal efficiency, simplicity, &c., of gas-heated hot-water apparatus. It cannot be said that finality has yet been reached, but there are now available one or two really excellent types which, if properly installed, exercise their functions really admirably. The subject is one that must be treated very carefully and with some degree of technical knowledge, for in designing an installation factors arise which are not met with when other forms of gas-consuming appliances are under consideration. All gas men should be conversant with the principles of hot-water circulation, for, if the plant is to be successful, certain precautions are requisite to ensure satisfaction. The boiler may be efficient; but, unless the right sizes of pipes are used, and regard is paid to the distance from boiler to tank, and to the correct size of unit relative to storage capacity installed, and other circumstances are taken into account, gas as a form of energy cannot give its full service—the good qualities of the boiler being rendered void by the unsuitability or incorrect fixing of the apparatus itself.

When dealing with hot-water supply, it will, I think, be found that in some instances the general circumstances are such that a solid fuel (coke) apparatus would better meet the case; and the most satisfactory way is to be honest about the matter, and recommend that this cheap fuel should be adopted. The effect of installing a boiler haphazard, and without due regard to existing conditions and requirements, is likely to make for dissatisfaction and a high gas account, leading the consumer to express the opinion that he has not had value for his expenditure, resulting in the removal of the apparatus, and a disinclination to look with favour upon gas as a fuel for this or any other purpose connected with domestic apparatus. The effect of an imperfectly designed installation is far-reaching; and it is certainly preferable to view the matter in a broad way. To be over-zealous and omit the possibilities of coke is unwise, and care must be exercised in this respect, to see that no mistakes occur.

The general demand, especially where old property is concerned, is for a gas-boiler for use particularly during the summer months; and it is in these cases that difficulties and pitfalls occur. One cannot, of course, lay down any fixed rule; but there are certain general features which require consideration as a guide to proper installation, and which ensure efficient and satisfactory working.

1. Each case should in the first instance be made the subject

of a sketch showing the lay-out and general disposition of the plant.

2. The best type of boiler to instal must be determined, and regard paid to the conditions under which it is to be used. Among the points to be observed are: The casting should be good and of neat appearance; the burner should be so arranged as to allow of easy adjustment, and placed in such a position that impingement of the flame on the metal is avoided. Preferably, the boiler should be sectional, and the path taken by the water a tortuous one—incoming water being on the outside of the inner boiler casting. This latter feature is very desirable, for one of the points to be emphasized is that, where gas is used as a fuel, the demand for hot water is "a small quantity, at a high temperature, in a short time."
3. Circulation should not be too speedy, for this tends to low-temperature bulk; and means should be provided to retard the flow between the circulator and storage, where existing pipes of rather larger sizes than those which would ordinarily be installed have to be contended with. This adjustment should be made in the pipe sizes from the boiler, and in no circumstances should any form of check or reducing valve be inserted, because of the tendency to hold up lime deposits at the point of control.
4. A cut-out valve and thermostat should always be used.
5. Where secondary circulation is required, a night valve should be provided to conserve the heat during periods when hot water is not in demand.
6. When fixing a boiler as an adjunct to the kitchen range, the danger of inter-circulation between range and gas-boiler must be avoided; and this can only be done effectively by separate flow and return pipes between the heater and the hot-water storage. This is the only really satisfactory way, and one which gives the highest efficiency; but, as it cannot always be carried out, the introduction of 45° (*i.e.*, "pitcher") tees may be resorted to in difficult circumstances. This practice should, however, be discouraged, because intercirculation is practically inevitable; but when so employed, the tees should be set at a point as far distant as possible from the heating unit.
7. Where it is not desired to take advantage of the storage cylinder or tank for warming purposes, it should be lagged.

A very desirable installation from the gas undertaking's point of view is the combination of coke and gas for water heating, together with a gas-cooker installed in kitchen recess; this being possibly the most up-to-date method of providing for this feature of domestic service. Perhaps one of the points which is often disregarded is that of proper ventilation; and particular attention should be paid to flues, for considerable inconvenience is often caused by the neglect to provide adequate means of removing products of combustion. Bafflers and caps should always be adopted, and the joints, where metal is concerned, sweated or soldered, socket and spigot ends being used. "Asbestone," a comparatively new material, is to be recommended; the cementing of joints and absence of destructive effects from condensation making this a highly desirable material.

With regard to the thermal efficiency of gas-heated hot-water supply apparatus, while this is largely governed by the nature of the installation, and circumstances previously alluded to, it may be said that the best results are obtained with systems designed on the cylinder principle or those where a "combined" plant is used. One should be able reasonably to anticipate a return of 75 p.ct. from a carefully designed plant; and this, I think, might be taken as a representative figure, and one which compares very favourably indeed with any domestic process involving heat transmission.

Discussion.

The PRESIDENT (Mr. Walter Grogono) said that one of the points in the paper which had attracted his attention was the statement that each case should in the first instance be made the subject of a sketch showing the lay-out and general disposition of the plant. This appealed to him greatly. He believed in sketching everything one could; nothing else impressed a thing so much on one's mind. As a works man, the advice to lag also met with his hearty approval. He did not know "Asbestone," but he was acquainted with various materials like it, and they seemed to be rapidly coming into their own. He had in mind one large roof composed entirely of corrugated asbestos sheets, which had given no trouble whatever, and had been up for more than three years.

Mr. W. R. MOGER (Tottenham) thought one aspect which should receive particular consideration was that of maintenance. Though an apparatus might be fitted up in the best practicable manner, very often the whole scheme was spoilt in a short period by matters connected with maintenance. He would like to know what Mr. Chandler's views were with regard to the cleaning-out of a circulator. In many instances, he himself had found return pipes corroded so badly that they had caused the removal of the plant through inefficiency. Was it really necessary to take down the apparatus each time it was cleaned, so as to make sure that the flow and return pipes were in perfect condition?

Mr. CHANDLER replied that, in his opinion, a boiler should be taken down at least once a year; but he did not think it was necessary for the pipes to be cleared so often as this. If by "corrosion" Mr. Moger meant a deposit of lime, a proper thermostat would prevent the water reaching a temperature at which such deposition would occur in the flow and return pipes.

Mr. MOGER: After circulators have only been cleaned from the front plates, I have come across trouble which could only be seen from the back.

Mr. H. W. KERRIDGE (Croydon) remarked that in the newer types of apparatus the trouble to which Mr. Moger referred had been overcome. Often he (the speaker) had felt very much out of touch with architects and builders, when they had evidently not the knowledge to enable them to design installations properly. It did seem to him that there was room for closer co-operation between the gas industry and those responsible for the erection of houses. The material which the author referred to as "Asbestone" was now called "Urastone."

Mr. D. J. WINSLOW (Lea Bridge District Gas Company) pointed out that due consideration should be given as to whether gas or coke should be installed. They got actual value from the gas consumed; but in the case of many large houses and institutions there was a domestic staff who possessed the bad habit of wasting water. This was where their trouble lay, and where gas suffered. He had often thought that a bonus of some kind, based on the relative smallness of the gas account, should be offered to the domestic staffs in places of this character.

Mr. CHANDLER replied that in most institutions there had been adopted the spring tap, on which the hand had to rest all the time the water was running. This was one of the best preventives of waste.

Mr. W. E. BROWN (Gas Light and Coke Company) said it very frequently happened that existing hot-water installations were defective; and trouble arose when they had to connect up to them with gas. Before starting the work, they should take steps to find out all about the existing installation. The author said means should be provided to retard the flow between the circulator and storage, where existing pipes of rather larger sizes than those which would ordinarily be installed had to be contended with. Would he not prefer to retard the return pipe?

Mr. CHANDLER: I do not think it matters.

Mr. BROWN: Lagging is apt to be rather expensive when applied to cylinders. Have you a cheap method to suggest?

Mr. CHANDLER: There are one or two very good compositions on the market, which serve the purpose excellently. In cases where lagging is necessary, I do not think it should be very difficult to convince the consumer that the saving in gas used over a period of years would far more than meet the cost of the lagging.

Mr. W. L. WESTBROOK (North Middlesex Gas Company), referring to the author's statement that one should be able reasonably to anticipate a return of 75 p.ct. from a carefully designed plant, thought this was a rather high efficiency as a practical percentage. Was it the result of a laboratory test, or of actual working? He should think for practical purposes 60 p.ct. would be nearer the mark. As to "Asbestone" or "Urastone" flues, he agreed that these were very efficacious where extensive condensation occurred; but, from the point of view of cheapness, he should prefer to keep to sheet-iron flues (which would last ten years) for geysers. It was certainly advisable when cleaning out a boiler to test it thoroughly, as he had experienced trouble of the kind already referred to.

Mr. CHANDLER did not agree that 75 p.ct. should be taken as a laboratory test, because in practice he had found that in a carefully designed installation such as he was dealing with, over 76 p.ct. efficiency could be got in actual practice. Therefore, 75 p.ct. might fairly be taken for an installation upon the design of which thought had been bestowed. Of course, he was referring particularly to new installations, and not to an old installation with a new boiler connected-up to it. If the cost of the composition flue was higher now than that of the ordinary flue, he was inclined to think that it would come down considerably as the sale increased. His own Company maintained a very large number of appliances, and he did not think their experience was so happy as that of Mr. Westbrook, who found an ordinary geyser flue would last ten years. Certainly a boiler or copper flue would not last so long. Therefore it seemed to him that a gas undertaking would be doing a wise thing in putting in composition flues—especially as they overcame difficulties inherent in ordinary flues.

Mr. F. S. LARKIN (Gas Light and Coke Company) recalled a number of experiments carried out eight or nine years ago in order to determine which was the best material to use for flue piping. Though a number of different kinds were tried, there was no doubt that "Asbestone," or some similar material, came out far cheaper in the end. Ordinary flue piping in some cases had to be renewed at the end of twelve months. There was one point of interest with regard to water supplies to apparatus. There was a strong move being made by the Water Board to get inserted in the Model Bye-Laws a clause to the effect that for feed water no connection whatever should be made of a main to apparatus without a visible break. This might have a very serious effect on the work of the gas industry, and so the matter required careful watching.

Mr. CHANDLER said he was unable to state anything official about the last-mentioned matter, though he knew something of the kind was on foot. Such a proposition would, he thought, receive strenuous opposition from the gas industry. If carried into effect, it would very likely retard the growth of gas consumption in this direction, mainly, of course, owing to the heavier capital cost.

The PRESIDENT: In the matter of lagging, choose the best every time; it is worth it.

NOTES ON WASTE IN THE DISTRIBUTION DEPARTMENT.

By E. L. OUGHTON.

"Waste" is defined as: "Useless—lying unused—superfluous material—loss—destruction." A "waster" is one who wastes.

From the foregoing dictionary definitions it is apparent that the labour of men, whether outwardly energetic or lethargic, may be futile if wrongly applied or neglected, and the individuals concerned may become actual wasters. Due to lack of method, waste is incurred in the execution of work, and in the utilization of appliances or materials. No one would care to deny

that avoidable waste or loss in various forms is not actually present in distribution departments. Yet, is there not a tendency to view it with a shrug of the shoulders, and say in the language of the East, "It is fate"? No gas undertaking, large or small, can, in these days of competition, afford to ignore any form of waste simply because it has existed for years. Conversely, efficiency in its most general term always yields tangible compensation, for lower operating costs due to elimination of avoidable losses in men, method, or material automatically bring increased profits to the undertaking, and ensure lower charges to the consumer.

The continuation of known avoidable losses must be characterized as either culpable negligence or colossal ignorance. Surely the consideration of a subject like this is pre-eminently suitable for Juniors, who are directly in touch with operations involved in the manufacture, distribution, and utilization of gas. As the purpose of these notes is to provoke discussion, some extreme cases are cited to illustrate the point at issue.

Is the establishment of an "anti-waste department" a practical proposition? In large undertakings, it could be under the direct control of the general manager, so that each department could be treated impartially. The type of man needed for such a post would have to be above suspicion, and free from bias.

The relation of avoidable waste and efficiency may be viewed as a formula, thus:

$$\frac{\text{Potential efficiency}}{\text{Avoidable waste}} = \text{actual efficiency.}$$

Example is better than precept, and so the heads of departments must set the example in personal efficiency and diligence, if those under their control are to be efficient. Untrained men as intermediaries between the undertaking and the public lose untold business, and waste energy in unproductive routine. Lack of method in executing work, and shortsighted vision in the choice of apparatus, will automatically condemn the use of gas. Broken promises, and a too literal interpretation of rules relating to consumers, often create friction and loss of business.

Sources of Waste.

Mains and Services.—Lack of co-operation with highways authorities and departments having like powers to open the roadways. Continued inadequate supply or pressure. Relaying of cast-iron mains when there is liability to subsidence. Relaying mains and services without special protection where ground is unfavourable. Renewing mains of same size without thought of developments—the cost of larger mains is comparatively small, while labour costs are approximately the same. Delay in systematically relaying larger services to meet increased demand. Neglect in charting every main and service. Omitting to test newly-laid mains under pressure while uncovered. Neglect of periodical inspection and testing of mains and services.

Internal Fittings.—No testing of meters *in situ*, or bringing each meter in for test or overhaul periodically, in view of the large percentage which are slow or standing with one light. Neglect in exchanging meters for larger sizes as appliances in use increase. Inflexible rule in computing standing meters and disputed computations. Allowing undersized pipes to be laid by the builders, and sometimes by the undertakings themselves on the score of economy. Omission of plugged tees where possible appliances may be fixed in the future. The use of square elbows and reducing tees instead of bends, round elbows, and equal tees. In the latter case reduction in size should be in the pipe run. Floor boards nailed down instead of screwed, and often left loose and creaking.

Lighting.—Timidity in not having 100 p.ct. as the objective in gas lighting. Lack of scientific application in all lighting installations. The use of so-called cheap lighting fittings in slot installations. Ill-fitting by-pass tubes which leak and drop out. Lack of systematic maintenance of burners; "quantity cleaned" being the aim, instead of "quality of the work performed."

Heating.—Fires fixed without due regard to the ventilating efficiency of the chimney. Lack of discrimination in supplying flueless heaters. Delay in fixing fires during a cold snap. This also applies to all seasonal appliances.

Water Heaters.—Circulators supplied in circumstances where the gas consumption will produce an atmosphere of distrust and enmity towards the use of gas, and so jeopardize future business, when a coke boiler would have given full satisfaction. Circulators, hot-water cylinders, tanks, and circulating pipes unlagged when fixed in exposed positions. Faulty flue-pipes and inferior materials used.

Power.—Lack of periodical inspection of gas engines, and indicating where necessary; thereby losing confidence of user. Ignorance of actual costs of competing power agents under varied conditions.

Industrial and Trade Uses.—Empirical calculations of initial, running, and maintenance costs. Low consumption gas-appliances ignored. Restricted rebates for "trade" uses as distinguished from "industrial." Undeveloped fields where gas might be used.

The following formulæ briefly express avoidable losses or waste in three phases, and may be adapted for every section.

(1) $\dfrac{\text{Labour usefully applied}}{\text{Misdirected or wasted labour}}$ = loss in man power.

(2) $\dfrac{\text{Business available}}{\text{Business obtained}}$ = loss due to method.

(3) $\dfrac{\text{Materials needed}}{\text{Surplus or wrong material supplied}}$ = loss in material.

These are closely inter-related, and cause a cumulative loss to the undertaking, which, when preventable, is waste.

Discussion.

The PRESIDENT (Mr. Walter Grogono) remarked upon the number of practical points raised by the author. As for himself, he hated square elbows. They had caused him more trouble than almost anything else he had met. To his mind, they should be abolished altogether. He supposed they all realized there were occasions—and fairly frequent ones—when a coke water-heater would meet the requirements better than gas apparatus.

Mr. A. BROADBENT (Gas Light and Coke Company) expressed disagreement with the way in which the formulæ were set out in the paper. They did not convey the meaning which the author intended.

Mr. OUGHTON: If you work these by logs, when you divide you subtract. [Laughter.]

Mr. D. J. WINSLOW (Lea Bridge District Gas Company) said that, under his sources of waste in connection with heating, the author instanced delay in fixing fires during a cold snap. He would like to ask him for his remedy.

Mr. OUGHTON replied that this depended upon the staff available and the steps taken by the man in charge to hold up non-essential things for the moment. It would probably be found that there were appliances which could be so held over. A cooker was not so important during a cold snap as a gas-fire.

Mr. G. WINSLOW (Gas Light and Coke Company) asked what the author considered the best protective arrangement for mains and service pipes.

Mr. OUGHTON answered that he was referring specially to made ground and acidiferous sub-soil. One method in a bad case was to make a box round the pipe, and fill it in with tar or bitumen; but very often one could fill the box with virgin soil.

Mr. S. B. CHANDLER (Tottenham) remarked that Mr. Oughton had put before them a very formidable list of sources of waste; but was it not a fact that in every undertaking, whether gas, electricity, or anything else, circumstances arose from time to time which it was not possible to meet? But, while saying this, he must add that in no undertaking, so far as he personally was aware, did such a condition of affairs exist as had been represented in the paper. In view of the greater attention now being given to the distribution side of the business, constant progress might fairly be looked for; and therefore it was absolutely unnecessary for any such department as the author had outlined to be instituted. Imagine the great amount of friction—which was a very bad thing in any undertaking—which would be engendered in every branch by the activities of such a department.

A MEMBER said he had been struck by the insertion, as one source of waste, of lack of co-operation with highways authorities and departments having like powers to open the roadways. Surely any undertaking managed properly, when doing work in connection with mains and services would act in conjunction with all the other authorities. As to periodical inspection and testing of mains and services, did the author mean examination for escapes, &c., or had he in mind the stripping of lengths of pipes? If the latter, he would have something to do. With regard to charting every main and service, all well-regulated undertakings plotted their mains; but to do this in the case of services—remembering that the frontages to most houses extended to from 18 to 30 ft.—would be a very big job.

Mr. OUGHTON replied that when referring to periodical inspection and testing of mains, he had in mind more particularly cases in which there were known subsidences in the district, or in which mains had been laid in unsuitable soil, and where it was consequently realized that there was a certain amount of leakage going on. Then he recommended a systematic district testing—bagging off, and inspecting in lengths. Up North more of this had to be done than in the South, where things were not the same as in mining districts.

Mr. W. R. MOGER (Tottenham) thought that most companies nowadays realized the absolute necessity of charting mains and services. He had seen a service which had been laid twenty years before, in a trough and covered with pitch, and it was just as good as when it was put in. He had also examined a main which, covered with Dr. Angus Smith's solution, had been in the ground for thirty years; and it was still in perfect condition.

Mr. LEONARD LACEY (Gas Light and Coke Company) said Mr. Oughton had drawn their attention very forcibly to the necessity of dealing with questions of waste; but there was one point which always had to be faced, and sometimes presented considerable difficulty—namely, what expenditure was justified in putting an end to any particular form of waste. Most of them could put their fingers on instances of waste; but it often needed a very shrewd man to decide how much money could justifiably be spent on preventing that loss. Frequently the cure was worse than the disease.

Mr. J. G. JOYCE (Gas Light and Coke Company) said the author gave as a source of waste restricted rebates for "trade" uses as distinguished from "industrial," and he would like some further information on this point. Was the author of opinion that all industrial uses should be given a discount?

Mr. OUGHTON explained that very often bakers had a considerable consumption of gas; and fish and chip fryers also used a lot. Such customers should have every consideration. He did not include lighting, or such things as that.

GAS SALES AND BUILDERS' BUSINESS.

By W. L. WESTBROOK.

The progress made in gas-fire construction in recent years, and the degree of perfection attained, coupled with the progressive policy of gas undertakings, is resulting in the steady displacement of coal grates. The improvements in construction of gas-cookers and hot-water appliances is strengthening the position of gas as a fuel, and increasing its already great popularity. In view of this, and taking into consideration the pro-

gress of electricity for lighting, it will, I think, be generally agreed (except perhaps in the case of some of the large industrial centres) that the heating, cooking, and hot-water supply services are rapidly becoming the backbone of the business of gas undertakings.

It will be remembered that in Mr. Lacey's address to our Association this fact was illustrated by the growth of the peak day load in the Gas Light and Coke Company's area of supply. Every gas salesman knows the importance of carcassing work in extending our hold on the heating business; and it is therefore with builders' business that I propose briefly to deal. Builders, generally speaking, are keen business men, and always ready to adopt any appliance of a labour-saving character which will appeal to housewives, and so enable them (the builders) to find ready purchasers for their houses. Being in competition with each other, they are particularly keen buyers, but are nevertheless fully alive to the demands of their clients, and are willing to pay a fair price to secure the best possible equipment. Builders have always been aware of the labour-saving possibilities of gas appliances; and it is up to gas undertakings to assist and co-operate with them to the fullest extent, keeping them posted with the latest developments and improvements, and giving them the best possible terms for appliances and for carrying-out work. Like all good business men, builders are keenly interested when the goods offered will reduce their capital outlay, in addition to improving the equipment of their properties. This fact was demonstrated by the ready adoption of the built-in gas-fire and gas-flues.

Coming now to the question of the gas register grate, I should like to know what gas undertakings are doing to co-operate with builders in this line. The position as I see it is this—given a good range of selection at the right prices, builders are ready to put gas-grates into all bedrooms, and, in fact, into all rooms, except, perhaps, kitchens and dining-rooms. There is a number of small cast-iron register gas-grates on the market, but these are mostly only suitable for very small rooms, and do not offer the variety of selection needed in the villa type of residence. A range of attractive inexpensive wood mantels, complete with gas-fires, which can be simply and quickly fitted, is needed. Cannot gas undertakings assist here? It is undoubtedly their business, for it is essential that the fires and burners of these gas registers shall be of the best type, which means that they must be manufactured by gas engineering firms with the necessary experience. The alternative will be gas register grates made by inexperienced firms, fitted with cheap and inefficient burners that will not add to the reputation of gas for heating.

With regard to the carcassing of new buildings, we must remember that the installation of gas piping is a very small item from the builders' point of view; and it is the gas undertakings' business to see it is not overlooked. Many gas concerns keep a record of new buildings in course of erection, and of structural alterations and repairs; it being the duty of all members of the outdoor staff to report any work of this nature noted in the course of their duties. Records of this description enable the management to keep in touch with the progress of building operations throughout their district, and ensure that an estimate for carcassing is sent in good time, and followed up until the order is secured. The records are also useful in other directions. For instance, if a showroom attendant can ascertain that geyser or fire supplies are laid on in a particular house, it will enable him to book an order forthwith, and save a call and estimate.

One of the difficulties we have to contend with is the identification of houses in which services have been laid. For example, in a certain road two or three different firms are building houses. Some may pay for services to be laid, while others cannot be induced to do so. In many cases building is started in the middle of a road, and we get an order (say) to lay six services to new houses for a certain builder, while on an adjoining plot another firm have erected houses, but will not pay for services to be laid. Later, an application is received for a supply of gas giving a name or number to the house, and we are unable to tell from our record of services whether the particular service is laid or not. If, therefore, roads can be visited as soon as the houses are named and numbered, and particulars obtained and posted in service records and on the carcassing cards, it will be of great assistance. Appended is a sample carcassing card and report slip.

In reference to co-operation, it is the practice of some builders to instal gas-appliances to their clients' instructions; and if they can obtain the required goods promptly and on favourable terms from the local gas undertaking, it is satisfactory to both parties—the builder getting the advantage of the gas showroom and stores, prompt delivery, no trouble with goods broken or damaged in transit, while on the other hand the gas concern has the satisfaction of knowing that appliances of sound construction are being installed. It is helpful to business if builders can be induced to visit the gas showrooms, where apparatus can be inspected and demonstrations given. In areas where extensive building operations are in progress, a builders' section might be set up with a stock of coppers, hot-water apparatus, built-in fires, &c. The gas show-house is also an important item that is helpful to both builders and gas undertakings, especially in the case of the development of a large estate. As an alternative to the furnished show-house, arrangements might be made to fit finished houses throughout with gas appliances, the gas undertaking agreeing to remove any apparatus not required by the purchaser or tenant of the property, and to refix it in the next finished house. This arrangement is very helpful to builders in the winter months, for they are able to make use of the gas-fires for drying out the houses that are sold, and preparing them for occupation in less time—not to mention the added attraction of cheerful radiant fires in the rooms when the prospective purchaser comes along.

With regard to carcassing, it is policy to use the best-quality piping and fittings, and to instal pipes of adequate capacity for the maximum possible requirements. Where necessary to chase in or to cut away, the work should be neatly done, as a good builder does not like his brickwork damaged. The same remark applies to the cutting-away of joists. If pipes of larger diameter than ¾ in. are being laid across the joists, the line taken should be as near the bearing as possible. In some cases it may even be wise to divide the load by using two separate pipe lines, even at the cost of a little additional piping. Another important detail is the position of terminating the points, especially in the case of gas-fires. A little trouble taken in the initial arrangement may save a lot of work afterwards. It is very annoying, when a house is completed, to have to extend fire points or find they terminate under the mantel surround, and have to be cut out. A board cut to cover two joists over a gas point is a great convenience. It is essential that all carcassing work should be thoroughly tested at a pressure of not less than 10 in. water gauge, and proved sound immediately on completion, while the pipes are accessible. The use of acetylene in locating leakages is often helpful. If, however (as I recommend), the work be tested in small sections as the job proceeds, defects can be located quickly, and remedied immediately; and should the final test show a leakage, only the last section need be examined. Appended is a specification for carcassing medium-size villa residences; the pipe sizes given being also applicable for the installation of additional appliances in finished houses.

NORTH MIDDLESEX GAS COMPANY.

Specification for Carcassing for Gas-Fires, Geysers, Cookers, &c.

In order to ensure the satisfactory working of gas appliances in the Company's area of supply, the following specification should be followed when buildings are being carcassed.

GROUND FLOOR.

Apparatus.	Size of Piping not less than	Remarks.
Cooker	1¼ in.	Main supply *ground floor*.
Circulator	¾ in.	Branches from 1¼ in. main supply.
Copper	¾ in.	
	½ in.	
Fires in:		
Dining-room	¾ in. main fire supply	Not more than two fires off ½-in. piping.
Drawing-room		
Hall	½ in. branches to fires	For rooms over 2500 sq. ft. area, ¾-in. supply to each fire from 1¼ in.

FIRST FLOOR.

Geyser (2½ gall.)	1¼ in.	Main supply to first floor, to cover branch to geyser.
,, (3½ gall.)	¾ in. branch up to 50 ft. run	Off 1¼ in. main supply.
,, (4 gall.)	1 in. ditto	Ditto.
Three fires	¾ in.	½ in. branches to each fire, see above.

All pipes should be laid with a fall towards the meter, or, where this is not possible, to a drip pipe or syphon provided to collect condensation. Tee pieces with plugs should be fitted to the bottom of all rising pipes. All open points should be securely plugged or capped, and pipes tested under air pressure up to 10 in. water gauge, and proved sound before the pipes are covered.

The Company will not connect fires or geysers where smaller pipes than above specified are laid, or if the installation will not pass the test for soundness.

North Middlesex Gas Company.

NEW BUILDINGS AND CARCASSING CARD.

Date.	Road or Street.	Number of Houses.	Number of Rooms.	Points Required.	Approximate Date for Carcassing.	Name and Address of Builder and Architect.	Length of Service Required.	Main Laid or Length Required (Yards).	Estimate Given for Carcassing or Letter Sent, Date and Remarks, Reported by—

NORTH MIDDLESEX GAS COMPANY.

REPORT *re* NEW BUILDINGS.

Road	Date
Builder	Address
Architect	Address
No. of houses	No. of rooms per house
Foundations laid	
Roof high Roofed	Points required
Length of service required, feet	Main laid or length required, yards

Reported by.....

Discussion.

The PRESIDENT (Mr. Walter Grogono) had often thought that a gas company must be extremely useful to a builder, who could send his clients along to the showrooms to see all the latest things in gas appliances. If one went into a cold, empty house, that had been unoccupied, the impression received was not likely to be particularly pleasant; but if some gas-fires had been fitted, put into use, and the house properly aired, prospective customers were likely to be much more attracted.

Mr. D. C. CROSS (Lea Bridge District Gas Company) asked the author whether he disapproved of reducing tees, and, if so, why. He did not altogether agree with the President as to the fitting of gas-fires in unoccupied houses. People who had purchased or rented a house liked to have the selection of their fires themselves, and not have thrust upon them patterns which had been chosen by others. The suggestion made might be a disadvantage in this way.

Mr. WESTBROOK replied that the use of reducing tees depended upon circumstances. If he could see a definite end to that pipe line, and was certain that nothing else would be added later on, he put in a reducing tee; but if there was any possibility of extensions, he would not do so. As to the selection of gas-fires by the builder, of course, one could never please everybody; but they were up against this trouble with the coal-grate precisely the same as with the gas-fire. So they would be no worse off in this respect than was the case before.

Mr. E. L. OUGHTON (South Suburban Gas Company), touching upon the provision of gas-fires in new houses, said he had been surprised down South at the number of gas-fires that were fixed up against wonderfully artistic coal-grates, when there were highly efficient inset fires which would give these coal-grates the appearance of really good gas-grates. Providing the chimney was all right, the inset fire could cok part and parcel of the original grate.

Mr. WESTBROOK replied that he had no objection to the inset fire, so long as a good job was made of it; but he found two drawbacks to the curved type. One was that, particularly in new chimneys, there was apt to be a drying and consequently a loosening effect upon the mortar; and, secondly, he believed there was a considerable amount of radiant energy directed up the chimney.

Mr. D. J. WINSLOW (Lea Bridge District Gas Company) asked what was the price of these mantel surrounds and gas-fires combined, as compared with the ordinary coal-grate. Builders were a conservative class, and the average one liked to provide a fireplace in which the purchaser could make use of either coal or gas. The industry had to educate the public to the beneficial effects of gas-fires, so that they would be anxious to have them fitted in every room except the kitchen and the dining room; but so far as the builder was concerned, he was out to save or to make money.

Mr. S. B. CHANDLER (Tottenham), referring to Mr. Westbrook's remarks as to the curved type of inset fire, pointed out that radiant heat travelled in straight lines, and could not go up the chimney. A body must be incandescent to give off radiant heat. The paper brought home to all of them the wonderful effect of co-operation between the gas undertaking and the builder. He had long regarded this co-operation as a most potent factor in the sale of gas. Builders were all the time making consumers for the gas industry; and the undertakings must do all they could to foster the goodwill—which he found to exist at present. But the post-war builder was out to erect a house and sell it as cheaply as he could; and he sought the lowest priced things that could be obtained. The problem for the distribution man was to meet the views of the builder, who should, anyhow, always be offered exceptionally inviting terms.

Mr. WESTBROOK said that in cost Mr. Winslow had raised a big point. What he (the author) was appealing for now was a grate of sufficiently good design for the villa type of residence, which would enable them to cut out the coal-fire. The builders did not mind paying a bit more for gas-grates—say £1 per grate—because they knew that to have gas was worth it. The houses that were going best in his Company's area of supply were those fitted with gas-fires. The curved type of inset fire in his district did get incandescent at the top, and this was back under the canopy.

Mr. G. WINSLOW (Gas Light and Coke Company): Who pays for the gas used for drying-out houses after they have been built?

Mr. WESTBROOK: The builder, and he pays for it with pleasure. He regards it as money well spent, for he can thus get his house ready earlier. It is a selling point for his houses to have gas already laid on to fires.

Mr. A. S. STAINER (Brentford) thought it was most important that gas undertakings should get on the right side of the builders. It would be well even to supply them with gas-fires at cost price, as one way of doing this.

In connection with a Wonders of Science Exhibition at King's College, from Dec. 29 to Jan. 9, a series of popular lectures will be given—including one, on Jan. 4, at 2.30 and 6.30, by Mr. A. H. Barker, B.A., B.Sc., on "The Heating of Houses," and another, on Jan. 8, at 7.15, by Prof. Leonard Hill, M.B., F.R.S., on "Sunlight and Fresh Air in Relation to Health."

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Discovery of Escapes of Gas under Modern Paving.

SIR,—Your comments on the discussion on my paper "The Position of Mains in Public Highways" show that I did not make myself clear when, in answer to Mr. Liberty's remark that under modern paving gas escapes might continue for a long time undetected, I replied that escapes were now more readily found under modern paving than under the old macadam roads.

What I meant was that escapes of gas, though small, cannot exist for long without men working in electric or telephone boxes, &c., becoming aware of them. I did not mean that escapes, when known to exist, are easily located.

STEPHEN LACEY.

Gas Light and Coke Company,
Horseferry Road, Westminster, S.W.,
Dec. 14, 1923.

Charges for Power Gas at Tipton.

SIR,—We notice reported in the "JOURNAL" to-day an amended scale of prices to be charged by this Department for power gas, commencing with the March quarter, 1924.

This scale should be preceded by the wording, "Up to 100,000 c.ft., 3s. 9d. per 1000 c.ft.;" and upwards of this amount, as per the attached table.

WM. PRINCE,
Engineer and Manager.

Gas-Works, Tipton, Dec. 13, 1923.

ENCLOSURE.

TIPTON URBAN DISTRICT COUNCIL GAS DEPARTMENT.

Scale of Charges for Power, Jan. 1, 1924.

Up to 100,000 c.ft., 3s. 9d. per 1000 c.ft., or 10d. per therm.

Upwards of 100,000 c.ft., and under 500,000 c.ft., 3s. 6d. per 1000 c.ft., or 9·4d. per therm.

Upwards of 500,000 c.ft., and under 1,000,000 c.ft., 3s. 5d. per 1000 c.ft., or 9·2d. per therm.

Upwards of 1,000,000 c.ft., and under 2,000,000 c.ft., 3s. 3d. per 1000 c.ft., or 8·7d. per therm.

Upwards of 2,000,000 c.ft., and under 3,000,000 c.ft., 3s. 2d. per 1000 c.ft., or 8·5d. per therm.

Upwards of 3,000,000 c.ft., and under 4,000,000 c.ft., 3s. per 1000 c.ft., or 8·0d. per therm.

Upwards of 4,000,000 c.ft., and under 5,000,000 c.ft., 2s. 10d. per 1000 c.ft., or 7·6d. per therm.

Over 5,000,000 c.ft., 2s. 9d. per 1000 c.ft., or 7·4d. per therm.

Tully-Gas Analysis.

SIR,—My attention has been called to Mr. Bloor's paper, and especially to the "Typical analyses of town gas supplied by various gas undertakings." The first point that strikes me is the 26·29 p.ct. of nitrogen in column "K"—coal gas from horizontals and carburetted water gas. I presume this is the York supply. If so, it is an extraordinary production. In column "P"—Tully gas (69 p.ct. of coal and 31 p.ct. of coke)—the carbon-dioxide content is given as 10·9 p.ct., which is extraordinary. A recent analysis which has been given me of Tully gas is as follows:

CO_2	4·0
O_2	0·2
C_mH_n	1·2
CO	33·4
H_2	48·8
CH_4	7·05
N_2	5·53

This is a typical Tully gas, containing under 10 p.ct. of inerts, and of a calculated calorific value of 368 B.Th.U. This gives 200 therms per ton of fuel carbonized, and a yield of 10 gallons of tar.

I shall be pleased to arrange for Mr. Bloor to verify these figures.

C. B. TULLY.

The Grey House, Carlton-on-Trent,
Newark, Notts, Dec. 12, 1923.

Gas Exhibition in Aldershot District.

An excellent gas exhibition has just concluded at Elstead, a village about 6 miles from Aldershot, to which gas-mains have recently been laid. The exhibition was organized by the Aldershot Gas, Water, and District Lighting Company. Demonstrations of cookery were given each afternoon and evening by Miss K. H. M. Bonham-Carter, B.Sc. (Household and Social Science), who prepared practical and appetising dishes before a large assembly of visitors. The display of gas apparatus by the Richmond Gas Stove and Meter Company, Ltd., Warrington and London, included a selection of their well-known "Bungalow" cookers and "Standard" gas-grates. The exhibition created considerable interest in the district.

Further Reductions at Sheffield.—The Sheffield Gas Company announce that there will be a further reduction in price from the meter readings for the December quarter accounts. In the various scales, according to the amount of gas consumed, there are reductions of 0·2d. per therm, with the exception of those taking beyond 30,000 therms, who get a reduction of 0·4d. per therm. The new rate for quantities up to 500 therms will be equal to 3s. per 1000 c.ft.; up to 2500 therms, 2s. 4d.; up to 15,000 therms, 2s. 3d.; up to 30,000 therms, 2s. 2d.; in excess of this, 1s. 11d. This is the third reduction in price made by the Company this year.

REGISTER OF PATENTS.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Dec. 12.]

Nos. 30,318 to 30,916.

BRAYSHAW, E. R. & S. N.—"Gas-burner." No. 30,865.
CERASOLI, A.—"Water-gas generators." No. 30,644.
GIBBS, J.—"Locking-device for gas-main cocks." No. 30,598.
HARBORD, A. E.—"Hotplates and ovens." No. 30,327.
HORSNAILL, H. F.—"Incandescent gas mantle, &c." No. 30,896.
HUESSENER, K.—"Combustion of gases in regenerating furnaces." No. 30,480.
ISHERWOOD, H.—"Gas-burners." No. 30,867.
MACKINTOSH, F. H.—"Gas-tight joints." No. 30,841.
NEWTON, H. T. & W. P.—See Mackintosh, F. H. No. 30,841.
NORTON, A. E.—"Means for holding lamp shades in galleries, &c." No 30,862.
PARKINSON AND W. & B. COWAN, LTD.—"Wet gas-meters." Nos. 30,514, 30,619.
PEEBLES, W. C.—"Gas-governors." No. 30,335.
PERKS, C. J.—"Self-locking gas floor-tap." No. 30,935.
RADIATION, LTD.—See Brayshaw, E. R. & S. N. No. 30,865.
REPUBLIC FLOW METERS COMPANY.—"Pressure indicators." No. 30,481.
ROTARY METER COMPANY, LTD.—"Rotary meters." No. 30,513.
SIMPSON, J. F.—See Peebles, W. C. No. 30,335.
TERRY. J. H.—See Gibbs, J. No. 30,598.
THORP, F.—See Rotary Meter Company, L'd. No. 30,513.
THORP, F.—See Parkinson and W. & B. Cowan, Ltd. Nos. 30,514, 30,619.

LEGAL INTELLIGENCE.

PROLONGATION OF PATENT.

In the Chancery Division of the High Court of Justice, last Thursday, Mr. Justice ASTBURY heard an application by Mr. Bernard Robert Parkinson (the registered proprietor of patent No. 23,414 of 1907 for "Improvements relating to securing the ends of service pipes to gas or other mains") and Messrs. J. Stone and Co., Ltd. (the licensees for the manufacture and sale of the invention), for an extension of the term of the patent. The application was based on the ground that the invention had only come into general use gradually, and that the parties had not been sufficiently recompensed—the total royalties for six years amounting to only £736. Before the war, the royalties had reached £1020 for the year; but they then dropped, owing to the fact that gas companies did not lay any new mains, while the increase in rates prevented municipalities from entering upon new enterprises. Mr. Byrne (who appeared for the applicants) submitted that, in view of the rapid development before the war, the case ought not to be dealt with on a mere average system, but on a more liberal basis. The patent expired on Oct. 23. Mr. Dighton Pollock (for the Board of Trade) said he should not oppose an extension of four years; and Mr. Byrne expressed his willingness to accept the offer. His Lordship accordingly made an order extending the terms for four years.

Coalowners and Railway Rates.

The hearing of the application of the Monmouthshire and South Wales Coalowners' Association, the Monmouthshire and South Wales Coke-Ovens and Bye-Products Works Association, and the South Wales Patent Fuel Manufacturers' Association *v.* the Great Western Railway occupied the Railway Rates Tribunal for eight days. The application was for the abolition of the flat-rate increase at present imposed on coal, coke, and patent fuel. Mr. W. B. Clode, K.C., read the unanimous finding of the Court refusing the application. He said that the applicants had put their case for abolition on the ground that the Minister of Transport was wrong in directing that the flat rates should be charged on fair traffic. The Commissioners found, as a matter of fact, that the traffic carried on now was substantially the same as when the flat rates were originally imposed. The appellants had also submitted that the rates were excessive, but here again the contention failed. In refusing the present application, the Commissioners did not wish to preclude the appellants from renewing it at some future time when the grounds for it might be more substantial.

Bishop's Stortford Co-Partnership Scheme.

A large number of the employees of the Bishop's Stortford, Harlow, and Epping Gas and Electricity Company were present at Long's Restaurant last Thursday, when they were entertained at high tea by the Chairman and Directors. Mr. E. L. Burton (the Chairman) presided, and was supported by other Directors. Capt. R. Staley, M.C. (Engineer and Manager), and Mr. S. E. Knowles, F.C.I.S. (Secretary), were also among those who attended. The Chairman explained at length the co-partnership scheme that is being introduced by the Company, and which the gathering was arranged to inaugurate. In addition to this, the Company are starting a pension scheme. The Company, he said, were not giving something for nothing—they were giving something for good service rendered. They wanted old servants, loyal servants, true-hearted servants, who would do their best to serve the undertaking. Capt. Staley, on behalf of the entire staff, thanked the Chairman and Directors for their generous hospitality. In the course of the proceedings, the Chairman signified his approval of a suggestion that the co-partnership meeting should become an annual event.

MISCELLANEOUS NEWS.

CONTINENTAL UNION GAS COMPANY, LTD.

The Ordinary General Meeting of the Company was held on Tuesday of last week, at Winchester House, Old Broad Street, E.C.—Col. H. LEROY-LEWIS, C.B., C.M.G., D.S.O., in the chair.

The SECRETARY (Mr. Edwin C. Bode) read the notice convening the meeting and the Auditors' report; and the report of the Directors and the statement of accounts were taken as read.

THE CHAIRMAN'S SPEECH.

Ladies and Gentlemen,—I beg leave to move that the report and accounts be received and adopted; and, in doing so, I should like to deal shortly with certain matters which have affected the Company during the year ended June 30 last, and our prospects for the future. I shall first call your attention to the affairs of the Continental Union; I shall then briefly refer to those of the Union des Gaz, on whose prosperity, as most of you know, that of our Company depends in a large measure.

THE PROFIT AND LOSS ACCOUNT.

If you will turn to our profit and loss account, you will find that the management and general charges are £19 less than last year—a small difference calling for no comment. The provision for taxes has increased from nothing to £2800, owing to the receipt of a dividend from the Union des Gaz, to which I shall refer later. Owing to the fluctuations in exchange, we have again transferred a sum of £3000 to a reserve account. On the credit side of the profit and loss account, you will notice that the dividend paid in January last on the preference stock absorbed £5700, and reduced the carry forward from £6871 to £1171. Dividends and interest received during the year amount to £18,663, being an increase of £8244. This is mainly due to the payment by the Union des Gaz of a dividend of 3 p.ct. We are glad that our hopeful anticipations as regard that Company's resumption of dividend payment have been so fully justified. The amount refunded for income-tax on management expenses shows a decrease of £465 this year. The refund last year was abnormally high, owing to the management expenses in 1920-21 having been somewhat inflated by the commutation of the Messina pensions. Furthermore, the amount received back this year is calculated at 5s., against 6s. last year. Sundry receipts remain practically the same as last year. We are thus left with a balance of £11,835 16s. 3d. standing to the credit of the profit and loss account, an increase of £4964 on the corresponding figure of last year. The Board are therefore able to recommend payment of the full dividend of 7 p.ct. on the preference stock, less tax, an increase of 3 p.ct. over the amount declared last year. This will absorb £10,587 10s., leaving a balance of £1248 6s. 3d. to be carried forward. Most of you are doubtless aware that our Articles of Association provide that, before a distribution can be made on the ordinary stock, 7 p.ct. has to be first paid on the preference stock, and the full amount on the preference stock has now been earned for the first time since the end of the war. I lay special stress on this, because, among the very small correspondence we have received from stockholders, two lady stockholders have protested against the abnormally large dividend paid to the preference stockholders. We have, however, no power to modify that. We are bound to pay it. As to the future, the Board are confident of being able to maintain the regular payment of the full preferential dividend, and are even hopeful that this year's returns on our foreign investments will permit of some distribution, be it but small, on the ordinary stock.

THE BALANCE-SHEET.

If we now turn to the debit side of our balance-sheet, you will notice an increase of £3139 in the sundry creditors and credit balances. This is accounted for mainly by the increased amount standing to the credit of reserve exchange, to which I have already referred. On the credit side of our balance sheet, our investments are scheduled as "Gas and General;" and I am happy to be able to confirm that on our English gas and general investments your capital is not only fully represented by its book value, but a considerable appreciation is shown.

THE UNION DES GAZ.

Would that I could say the same for our large holding in shares of the Union des Gaz, in which some eight-tenths of our capital is invested. The heavy depreciation there shown is entirely a matter of exchange, for their price on the Paris Bourse has greatly appreciated. This is due to the general improvement in the gas industry in France; and if the franc would only share in this improvement, the condition of our capital account would be much more healthy than it is. There is no remedy for this state of things at present, and all we can do is to hold our souls in patience, and trust that the exchange position of France will improve. I shall refer to this question later, and give you some reasons for thinking that the condition of financial affairs in France is not by any means hopeless—on the contrary, that we have good reason to believe in the future prosperity of that great country. ["Hear, hear."] The Union des Gaz has, as mentioned in the report, resumed the payment of dividends. Three per cent., or 15 francs per share, was distributed last March for the year ended June 30, 1922; and it is not impossible that an even better result may be expected for this year. These dividends are paid to us in francs, and owing to the deplorable rate of exchange, the conversion into sterling means at present a loss of approximately 66 p.ct. Every 1 p.ct. dividend paid by the Union des Gaz represents the possibility of a 1 p.ct. distribution on the ordinary capital of the Continental Union, when the franc is at gold parity; but a depreciation of over 200 p.ct. in the franc means an equivalent reduction in our expectations. There is an increase of £7676 in cash at bankers, loans, &c. This is composed of a temporary investment in Treasury Bonds to provide for the preference dividend. Sundry debtors show a very small increase, which is of so slight importance as to call for no remarks. In my review last year of the history of the Compagnie l'Union des Gaz for the previous eight years, I stated that the results for the period up to 1921 culminated in

a loss of 2,785,000 frs., leaving a debit balance on the profit and loss account of 1,285,621 frs. Since we last met, their accounts for the year 1921-22 have been issued, showing that not only had their debit balance been wiped off, but in addition a profit had been made sufficient to permit a distribution of 3 p.ct. to the shareholders. As regards the Union des Gaz accounts to June 30 last, these have not yet been published; but I understand that they have had a very successful year—possibly permitting their Board at the forthcoming general meeting to propose an increased rate of dividend. You will be interested to learn that, since the war, that Company's electricity undertakings have greatly developed; the number of consumers being now more than 16,000, an increase of no less than 700 p.ct. on the pre-war number.

STRASBOURG NEGOTIATIONS.

You will remember that early in 1914 negotiations were completed with the Strasbourg Municipality by which, in exchange for a long concession, the Union des Gaz became part owners with the town. The town of Strasbourg was then under German rule, but has now reverted to France, and this change has naturally been beneficial to a French Company. During the past two years the profits derived from that undertaking have increased, and the general outlook is most satisfactory. We can confidently state that the Union des Gaz has overcome the serious difficulties with which it was confronted at the end of the war, and we may not unreasonably expect an increasing return on the capital we have invested in that undertaking. The Union des Gaz may, however, prosper; but if the franc continues to depreciate, the English shareholder will be unable to share in that happy condition, for the exchange market will take too heavy a toll of the franc during its translation into sterling.

IMPROVED OUTLOOK FOR FRANCE.

What are the prospects of France? It has been my custom at this meeting to put before you a few general considerations, which may help you to understand the reasons why I still continue to be an optimist with reference to the future of the franc, though I must confess that, if you look at the diagram hung on the wall for your inspection, the general curve upwards is not encouraging. Still, in these matters we must take long views, and not be discouraged by the contemplation of the events of these exceedingly critical years, through which we are now passing. In order to appreciate with any accuracy the present economic and financial position of France, it is necessary to refer to the period immediately following the war, and to compare the results obtained in that period with those of to-day. There is no need to recall the conditions under which France in 1918 resumed her industrial activity, nor to enlarge upon the overwhelming handicap under which she laboured as a result of the devastation of the Northern and Eastern Departments, in which district nearly the whole of the country's productive activity was concentrated in 1913, particularly as regards iron and coal. Nor is there any need to emphasize the fact that the terrible losses sustained by the French population between 1914 and 1918 complicated the question of labour very seriously. This labour problem, which, even before the war, was difficult to solve, constituted a serious danger at a moment when it was essential to set in motion again without delay the machinery which had been built-up by succeeding generations. An examination of the different elements on which can be based an appreciation of the economic position of a country, showed the following results, immediately after the Armistice. Firstly, as regards agriculture, the surface planted with wheat had fallen to 4,603,000 hectares, and the total head of cattle to 12,250,000. On the industrial side, the deficit in the trade balance, which before the war did not average 2 milliards, reached the figure of 17½ milliards in 1918. Imports of raw material fell, during the first seven months of 1919, to 21,672,000 tons—about 4,000,000 tons less than the total for the corresponding period of 1913. Exports of manufactured articles sustained an even more marked decrease, falling from 1,262,407 tons for Jan. 1 to July 31, 1913, to 271,314 tons for Jan. 1 to July 31, 1919. The number of travellers and loaded wagons dealt with was also greatly diminished, as was the production of cast iron, steel, and coal.

THE BUDGET PROBLEM.

With reference to the budget problem, the yield from taxation at this period represented less than 20 p.ct. of the total expenditure, of which the greater part consisted, it is true, of exceptional outlay, consequent upon the war. How has the situation developed since that period, and what is the position to-day? In the first place, as regards agriculture, in 1923 there are 5,626,000 hectares under wheat, approximately 1,000,000 hectares more than in 1919. The yield per hectare has also improved. The total head of cattle has risen to 13,575,000, an increase of 1,325,000, or 12 p.ct. over the figure for 1919. During the first seven months of 1919, France had to import a very considerable proportion of the material required for the sustenance of the population; to-day the country is practically self-supporting, at any rate as regards the essential foodstuffs. One can now foresee a time when she will become an exporter of the very products which she was formerly obliged to import. From the balance of trade point of view, the improvement has been even more pronounced. The deficit of 17,600 millions in 1918, of 23,900 millions in 1919, and 23,100 millions in 1920, has fallen to 2300 millions in 1921, to 3300 millions in 1922, and it amounts to no more than 810 millions for the period from Jan. 1 to Aug. 31, 1923. Imports of raw material required by the industries now exceed the 1913 figure. For the first seven months of 1922 they amounted to 25,017,000 tons; for the corresponding period this year, to 26,545,000 tons. Exports of manufactured articles reached 1,306,000 tons during the first seven months of 1922, and 1,600,000 tons during the first seven months of 1923. In this case, too, the 1913 figures are exceeded. This improvement in the trade balance has been not only very rapid, but also very substantial, since, both as regards imports of raw material and exports of manufactured articles, the quantities exceed the pre-war figures. The apparent adverse balance between imports and exports is, in nominal value, lower for the current year than it was in 1913. That is to say, taking into account the depreciation of the franc, it is three or four times less to-day than it was ten years ago. Furthermore, if it is borne in mind that the sums spent in France by foreign tourists are also considerably greater to-day than before the war, it is evident that the real balance, which takes into account the so-called "invisible" imports and exports, is more favourable that it has ever been.

FRANCE'S ECONOMIC REVIVAL.

This improvement which is indicated by the statistics of France's foreign trade is confirmed and explained by the economic revival of the country, of which the production has been constantly increasing since 1919. As regards coal, from Jan. 1 to Aug. 31, 1923, the production, reached 18,870,000 (excluding the Moselle and Sarre basins), as against 15,270,000 tons from Jan. 1 to Aug. 31, 1922. A similar increase is shown in the case of cast iron and steel. The average monthly production has increased from 285,000 tons and 254,000 tons respectively in 1920, to 427,000 tons and 378,000 tons respectively in 1922. The production of cast iron alone exceeded 480,000 tons in August, 1923. The number of unemployed, which has never exceeded 65,000, is to-day less than 1500. I only wish it were the same in this country. ["Hear, hear."] The same features are evident in the transport figures. The first seven months of 1923 show an increase of 3099 ships cleared and of 7,126,915 tons over the corresponding period of the previous year. The average daily number of railway trucks loaded has increased from 32,916 in 1920, to 37,359 in 1921, to 44,375 in 1922, and to 49,750 in 1923 (to end of August). The total number of trucks loaded in 1922 was 16,150,000, against 9,930,000 in 1920. During this period of two years, the number of passengers carried increased from 521 to 646 millions. Railway receipts have advanced from 3394 millions for the first thirty weeks of 1920, to 3929 millions for the first thirty weeks of 1923.

INCREASED TAXATION RECEIPTS.

This economic revival involves a corresponding improvement in the French budget. While the total of the normal revenue in 1918 was 9707 millions, in 1922 it reached 18 789 millions—a total increase of 93½ p.ct. For the first ten months of the present year, the receipts from taxation amount to about 23 milliards. The increase from direct taxation is 143 p.ct., and from indirect 88 p.ct., in the period under review. The tax on business turnover produced 1080 millions during the first seven months of 1921, 1275 millions during the first seven months of 1922, and 1638 millions during the first seven months of 1923. The yield is still more substantial during August and September. From 1922 to 1923 there is again an appreciable increase. It amounts to 11 p.ct. in direct taxation, and more than 12 p.ct. in indirect, for the period from Jan. 1 to July 31. During the first eight months of the present year, the French Treasury collected 13,285 millions in taxes; while extraordinary revenue (taxes on war profits, liquidation of war stocks, nominal receipts, and sundries) amounted to a further 1428 millions. The General Budget, of which about one-half is represented by the interest charge on the Public Debt, now balances, and an appreciable proportion of External Commercial Debt has been re-paid. Whether viewed from the economic or the financial standpoint, the present position of France contains no element of doubt, as there are indications of nothing but constant improvement. The burden of French finance, which compels the Treasury every year to borrow milliards, is the work of reconstruction, which represents, as was said above, the rebuilding in a few years of the work of several generations.

THE SPECIAL BUDGET.

The total amount borrowed by the French Government and applied in payment of expenditure which Germany undertook to defray (by virtue of the Treaty of Versailles) considerably exceeds 100 milliards, which represents an annual interest charge of between 5 and 6 milliards. This interest charge, war pensions, and the cost of administering the Reconstruction Department, compose the only real deficit—that of the Special Budget. It is the payment of indemnities for damage suffered in the war which necessitates the direct or indirect borrowing of milliards annually. This work is now nearing its end, and it is estimated that the reconstruction of the devastated areas will be completed in three years, involving a further expenditure of 23 milliards. If Germany had paid, when due, all those sums which she undertook to pay—even if she to-day re-imbursed the advances made by the French Treasury—the French budget problem would be solved, and France could, as other countries (and perhaps even better than other countries), effect the consolidation of her debt, and later proceed with its redemption and with the reduction of paper circulation. The mere fact of having been able to meet such exceptional expenditure in the absence of any payment from Germany, and without, furthermore, having had recourse in the emergency to any risky financial expedient, proves that the wealth and tarift of France are a sure guarantee of her financial recovery. One is entitled to believe, then, that this recovery will continue, slowly, perhaps, but surely, and that in the domain of finance, the improvement will be as marked as it is in that of agriculture, of industry, and of commerce.

CONFIDENCE IN THE FUTURE.

I feel, therefore, confident that, when the work of reconstructing the devastated areas is completed, the sound increase of the resources of France will enable her to face the future with equanimity, and that we shall gradually see the franc regain its old position. ["Hear, hear."] In this forecast, I must bar all political considerations, which are, of course, incalculable. I hope that you will not misunderstand me, and imagine that I wish to depict the position of France in too pleasing terms. I am only endeavouring to ask you to take long views, and to face the future in no pessimistic frame of mind, but rather to look forward to a time when the stockholders of this Company will be able to obtain a fair return on the money invested by them. [Applause.] I now beg leave to move that the report and accounts be received and adopted.

The DEPUTY-CHAIRMAN (Sir George Touche, Bart.) said he had great pleasure in seconding the resolution which had been proposed by the Chairman in a most interesting and illuminating speech.

Mr. G. A CAVE-ORME, J.P., remarked that the Chairman had given them a highly valuable account of the economic recovery of France. In this account, he had drawn their attention to the state of things in connection with what was called the Special Budget, where only there was a deficit. He presumed it was the fact that the whole of the expenditure in the Special Budget was in France itself, and therefore the economic aspect of the matter was not nearly so serious as would be the case if the money had to be spent out of France.

The CHAIRMAN replied that this was an enormously important consideration. The work of reconstruction had fallen upon the Special Budget, and they had spent on this account an enormous amount of money which should have been paid by Germany. It was the French themselves who had financed the loans, and the whole of the money had been circulated in France, so that the loss was very much more apparent than real. He was very much obliged to Mr. Cave-Orme for drawing attention to this important point.

The resolution was put to the meeting and unanimously carried.

RE-ELECTION OF DIRECTORS AND AUDITORS.

The CHAIRMAN next proposed that Mr. A. F. Phillips, M.Inst.C.E., and Sir James Remnant, Bart., M.P., who retired by rotation, be re-elected Directors of the Company. Mr. Phillips, he said, was a very old friend, and no words of his (the Chairman's) could endear him more to them than the feelings which actuated them at the present moment. In Sir James Remnant they had a member of the re-constituted Parliament. They had been in great doubt as to whether they should put "M.P." after his name in the report; but they were all glad to see that this difficulty had been solved in the right way.

Sir HENRY BIRCHENOUGH, Bart., K.C.M.G., seconded the resolution, which was carried, and acknowledged by Mr. PHILLIPS and Sir JAMES REMNANT.

The Auditors (Messrs. C. P. Crookenden, F.C.A., and G. A. Cave-Orme, J.P.) were also re-appointed, on the proposition of Mr. J. H. SOLOMON, seconded by Mr. HENRY JACOB.

VOTES OF THANKS.

The CHAIRMAN said it was now his pleasure to move that the thanks of the meeting be accorded to the staff at home and abroad for their services during the past year. He thought that this vote would peculiarly commend itself to the shareholders. The Company had a most devoted body of permanent servants, to whose merits he was delighted to testify. Their Secretary (Mr. Bode) was nearing his jubilee in the service of the Company, and when this happy time arrived he hoped they might find some means of celebrating it. ["Hear, hear."]

The Right Hon. Lord WARGRAVE, P.C., in seconding, expressed the hope that the celebration of Mr. Bode's jubilee might coincide with the resumption of dividends on the ordinary stock.

The resolution was heartily passed.

Mr. SOLOMON said he felt sure it would be the wish of all, before they separated, to pass a vote of thanks to the Directors, and particularly to the Chairman for the able manner in which he had conducted the meeting and for his interesting address on both the condition of the Company and of France. In past years they had been buoyed up by the very hopeful outlook presented by their Chairman, without which he feared they would on many occasions have despaired as to the prospects of their investment in this Company.

The resolution was seconded by Mr. WILLIAM BENNETT, and cordially agreed to.

The CHAIRMAN, in acknowledgment, said he thanked Mr. Solomon very much, on his own behalf and that of the Board, for the way in which he had proposed this vote, and the shareholders for their hearty concurrence. It afforded him personally very great pleasure to see Mr. Solomon with them, for he was the son of one of the original Directors of the Continental Union Company.

GAS REGULATION ACT APPLICATIONS.

The following further notices have appeared in the "London Gazette" with regard to applications to the Board of Trade for Orders under the Gas Regulation Act.

DECLARATIONS OF CALORIFIC POWER.

Cranleigh Gas and Coke Company, Ltd.—475 B.Th.U., in substitution for 500 B.Th.U. (April 1, 1924.)

Uxbridge, Wycombe, and District Gas Company.—470 B.Th.U., in substitution for 460 B.Th.U. (March 25, 1924.)

GAS REGULATION ACT ORDERS.

We have received from the Director of Gas Administration a copy of the following further Order made by the Board of Trade under section 1 of the Gas Regulation Act.

Rainford Gas Company, Ltd.

After the declared date, the maximum price in respect of gas supplied by the undertakers shall be 16d. per therm; and this price shall be substituted for the price of 4s. 6d. per 1000 c.ft. wherever it is mentioned in section 21 (price of gas) of the Rainford Gas Order, 1908.

After the declared date, "therm" shall be substituted for "1000 c.ft." in paragraph (ii) of Schedule B to the Rainford Gas Order, 1908, and the words "fifth of a penny" shall be substituted for the word "penny" wherever it occurs in that paragraph. (Dec. 13.)

Cheadle Gas Supply.—The price of gas was discussed at a meeting of the Cheadle Council last week, when Mr. Thorley inquired if there was any prospect of the charge being reduced, as he thought it was high time that the public should cease to be asked to pay 6s. 8d. per 1000 c.ft., in view of the price of coal. The Chairman said he could not promise any reduction in the price at present. He reminded the Council that the works had had to be reconstructed, and that the Gas Committee had only had the matter in hand five months. The work had caused them very great anxiety; but they had been pleased with last week's report, which for the first time stated that the gas was pure. As a member of the Gas Committee, Mr. Hanna said he did not think there was a gas concern in the country which had been worked with such poor apparatus and out-of-date appliances as the old gas-works at Cheadle. The Committee had worked hard to remedy the defect, and they felt very confident that in a short time the supply would be adequate for all needs.

LANARK COUNTY COUNCIL AND GAS UNDERTAKINGS.

Two More to be Acquired.

At a Meeting of the Lanark County Council, minutes of the Finance Committee which were submitted showed that, arising out of the proposal of the District Committee of the Middle Ward to acquire the undertaking of the Blantyre Gas Company, Ltd., several meetings had taken place between a Sub-Committee and representatives of the Company. It appeared that the Company's books had been examined by Mr. Peter Rintoul, C.A., who had been advising the Council in their negotiations with the Company as to the value of the undertaking. The negotiations had extended over a considerable period, and at a recent meeting an offer of £15,000 had been made for the undertaking. The Company, however, refused to consider sale of the undertaking at this figure; and the Sub-Committee were advised that, if they still desired to acquire the concern, they would have to resort to compulsory acquisition, in which case the price to be paid would be fixed by arbitration. The District Committee of the Middle Ward had again considered the question, and had expressed the view that the Blantyre Gas Company's undertaking should be acquired for the development of the Committee's scheme for the supply of gas within the Middle Ward district. They had formally recommended that, failing agreement, the Council should proceed to acquire the undertaking compulsorily. The Finance Committee, after consideration, resolved to recommend the County Council to acquire the concern compulsorily, under the provisions of the Statutes. The Council adopted the recommendation unanimously.

With reference to the proposal by the District Committee of the Middle Ward that the County Council should acquire the Stonehouse Gas Undertaking, the Clerk reported that several meetings had taken place between the Sub-Committee and representatives of the Stonehouse Gas Company, and that, subject to confirmation by the Council and the shareholders, arrangements had now been made for the acquisition of the undertaking for the sum of £10,000. The Finance Committee approved of the purchase on the terms stated. The Council also adopted this recommendation.

POWER GAS CORPORATION, LTD.

Mr. E. Lloyd Pease (the Chairman), presiding at the twenty-third annual meeting of the Corporation last Thursday, in London, said that the results of the trading had been detrimentally affected by the general scarcity of business. A large proportion of the men had, however, been employed throughout the year. There were indications of the return of better conditions; and the Corporation were well prepared to offer specialities which possessed many attractions from the point of view of the economical production of gas for all kinds of industrial uses. They had effected many improvements in their systems of gas production, and were now able to supply plants which, in thermal efficiency and recovery of bye-products in the form of tar, oils, and sulphate of ammonia, coupled with economy in capital cost and operation, marked a great advance upon anything which had yet been achieved. They had undertaken the manufacture of apparatus for the making of water gas, and had recently completed and set to work the first section of what would be one of the largest plants of its kind in the world; and their clients had expressed great satisfaction with it.

Their subsidiary, Messrs. Ashmore, Benson, Pease, & Co., Ltd., (whose works had been in existence more than fifty years) not only maintained their connection with old customers, but had been able to open up business with new ones. This concern, which was one of the pioneers in the construction of gas-works plant and gasholders, had been developing new specialities for improved efficiency in the production of gas for town purposes, as well as for the treatment of this gas. At the present moment they were starting-up a gas-retort and recovery plant in the Midlands, which was operating on a new principle, promising to mark a step forward in the cheap production of gas for domestic purposes. It was encouraging to receive in the autumn an order from the Montreal Light, Heat, and Power Company for the supply, delivery, and erection of a gasholder and tank having a capacity of 6 million c.ft. of gas, and costing upwards of £100,000. Messrs. Ashmore, Benson, Pease, & Co., with two other well-known English makers of gasholders, had formed a Company, called the Tankless Gasholder Company, Ltd., to construct and sell in this country and the Colonies gasholders of the special design which had been developed on the Continent. A large number of these holders had been erected in France, Holland, and Germany; and it was evident, from its rapidly-increasing use in those countries, that the new design possessed many advantages over the usual types.

The report and accounts were adopted, and the dividend of 4 p.ct., less tax, recommended was declared.

North Middlesex Company's Price Reduction.—The North Middlesex Gas Company, serving Hendon, Mill Hill, and Finchley, are reducing the price of gas by 1d. per therm.

Electricity Failures at Reigate.—During a discussion in the Reigate Town Council with regard to the provision of further electrical plant, regarding which the Electricity Committee reported their deep concern that the new transformers at Redhill, Reigate, and Mead Vale were not yet in commission, Alderman Ince wished to know whether any information could be given as to why there had been so many failures in the current recently. Mr. Pierce replied that, as to the two failures in the past fortnight, they had been able to maintain the current, but the transformers had been too small for their duties. Alderman Ince asked if he was to understand that, as soon as the transformers were re-arranged, they might hope to see a discontinuance of the many breakdowns that had happened recently. Mr. Pierce said there was no doubt the great cause had been their action in reducing prices for current and power. Everyone had taken advantage of it, and they really should not have done this until they were properly equipped. This was the cause of the transformers being overloaded at present.

TRADE NOTES.

Crossley Productions.

This is the title of a new booklet issued by Messrs. Crossley Bros., Ltd., of Openshaw, Manchester, who have built and sold over 100,000 engines. In this are illustrated engines of all types and sizes for various fuels. For nearly sixty years, the name "Crossley" has been identified with oil and gas engines; and this period has been for the firm one of continued progress, which it is hoped may be perpetuated.

"Columbus" Coke Separators.

Columbus Machinery, Ltd., of 216, Abbey House, Westminster, have recently received orders for their "Columbus" Coke Separator from Ramsbottom, Tunbridge Wells, Sunderland, West Hartlepool, Swansea, and Rushden, and have plants in course of erection or just completed at Dover, Portsmouth, Colchester, and Dublin. In addition to numerous other gas-works, where plants are already at work, these machines have been installed for dealing with large dumps at Bilston, Wolverhampton, Richmond (Yorks), Rayner Perkins, Coventry, Sanderson and Robinson, Mansfield, Bury Paper Works, and three large twin type at the Consett Iron Works.

Fire at the Preston Gas-Works.—There was an explosion at the Preston Gas-Works last Friday, following fire in a purifier. Fortunately the brigade were able to keep the outbreak in check, and the damage done was not considerable.

Walsall Gas Committee's Needs.—Sanction for loans amounting to £23,485 was sought in a resolution that the Gas Committee were to submit to the Walsall Town Council last week. The items were as follows: Past and future expenditure on gas mains and services, £10,000; prepayment meters, £10,000; breeze washing plant, £2650; oxide purifiers, £600; and rotary exhauster, £235.

Uxbridge Price Reduction.—In notifying their intention to increase the declared calorific value of their gas from 460 to 470 B.Th.U., the Directors of the Uxbridge, Wycombe, and District Gas Company add that they have decided to reduce the price of gas by 1d. per therm (equal by the new standard to approximately 4⅜d. per 1000 c.ft.), such reduction to take effect as from the reading of the meters for the quarter ending March 25 next.

Oswestry Gas Charges.—The Watch Committee of the Oswestry Town Council reported to a recent meeting of the Council that they had received a letter from the Gas Company offering to light the street lamps as at present existing for the sum of £1000 for the ensuing year; and instructions were given that information should be obtained as to the charges made for public lighting in other towns. The Mayor and Councillor Pasquill were appointed to meet the Directors of the Gas Company on the matter, when the information had been obtained.

CURRENT SALES OF GAS PRODUCTS.

Tar Products in the Provinces.

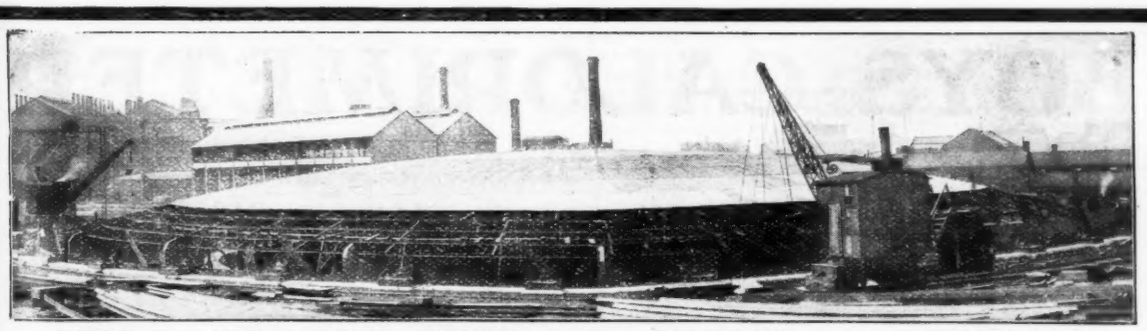
Dec. 17.

The market for tar products generally, with the exception of creosote oil, remains dull, and there will probably be no revival until the New Year. Pitch is very quiet indeed, and sales are reported on the East Coast at 100s., while low prices are reported to have been accepted in South Wales. The amount sold, however, is comparatively small, and makers generally appear to be content to hold on for the present. Carbolic acid is still dull, with little or no demand. Naphthalene remains neglected; and buyers do not yet appear to be prepared to pay the increase, which is necessary, owing to the advance in creosote.

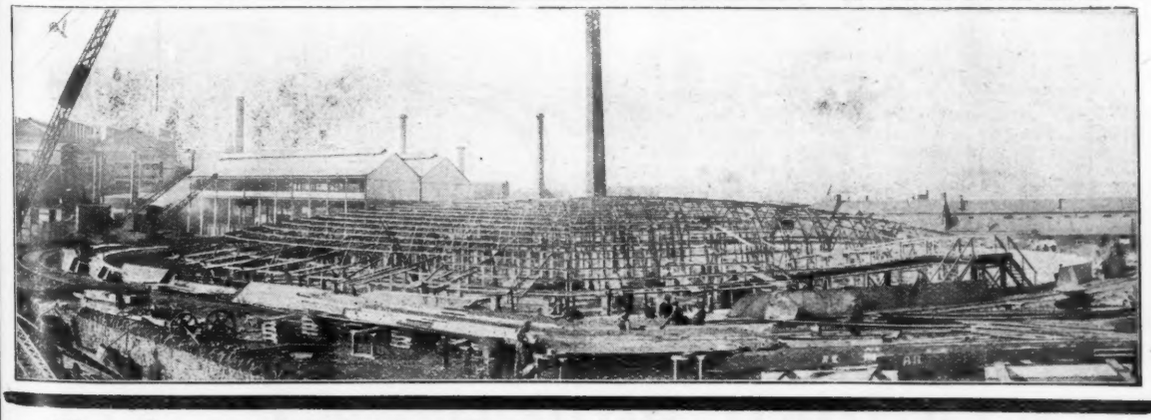
The average values for gas-works products during last week were: Gas-works coal tar, 64s. to 69s. Pitch, East Coast, 97s. 6d. to 100s. f.o.b. West Coast—Manchester, 92s. 6d. to 95s.; Liverpool, 93s. 6d. to 96s.; Clyde, 94s. 6d. to 97s. Benzole 90 p.ct., North, 1s. 0½d. to 1s. 1d.; crude 65 p.ct. at 120° C., 9½d. to 10d. naked at makers' works; 50-90 p.ct., naked, North, 1s. 5d. to 1s. 7d. Toluole, naked, North, 1s. 5d. to 1s. 7d., nominal. Coal tar crude naphtha in bulk, North, 7¼d. to 8¼d. Solvent naphtha, naked, North, 1s. 2¼d. to 1s. 4d. Heavy naphtha, North, 1s. 5½d. to 1s. 7½d. Creosote, in bulk, North, liquid, 8¼d. to 9d.; salty, 8¼d. to 8¾d.; Scotland, 8d. to 8¼d. Heavy oils, in bulk, North, 9d. to 9½d. Carbolic acid, 60 p.ct., 3s. to 3s. 2d. prompt. Naphthalene, £15 to £16; salts, £6 to £8, bags included. Anthracene, "A" quality, 4d. per minimum 40 p.ct., purely nominal; "B" unsaleable.

Another Reduction at Carlisle.—Announcing to the Carlisle City Council the decision of the Gas Committee further to reduce the price of gas 6d. per 1000 c.ft., to all consumers, Mr. Buck pointed out that in fifteen months from the opening of the new works they had lowered the price by 1s. 6d. per 1000 c.ft. The quality of the gas was excellent. With the price at 3s. 6d., they would be running things very fine.

Manholes in the City.—At a Court of Common Council at the Guildhall, last Thursday, a motion was submitted by Col. Vickers Dunfee, V.D., J.P., C.B.E., "That, having regard to the great inconvenience to traffic caused by the continued opening of boxes in the streets of the City by the Post Office authorities, the Streets Committee be instructed to submit a return of the number of manholes in the main streets, the number of times each one has been opened during the past year, and whether the works have been carried out by day or by night, and to report as to any steps that can be taken to minimize these serious obstructions to traffic." The motion, having been carried, was referred to the Streets Committee.



SEVEN-MILLION SPIRALLY-GUIDED GASHOLDER



R. & J. DEMPSTER, LTD., MANCHESTER.

LONDON OFFICE: 34, VICTORIA STREET, WESTMINSTER, S.W. 1.

THE NORTH-EAST COAST COAL TRADE.

From our Own Correspondent.

Features of the past week have been the continued weakness of Northumberland steams, and the pressure for prompt supplies of Durham coking. The latter, coming on an over-sold market, has enabled anyone who could offer odd parcels to ask fancy prices. For best qualities, 28s. f.o.b. could probably be obtained, while 26s. 6d. is generally asked for ordinary good qualities of unscreened for this month and January. There is, however, practically none available for the remainder of this month, and no great rush of buyers to pay these prices for January.

Other kinds of Durham unscreened are scarce for prompt, and steams maintain their price. Gas coals do not appear to be in any great demand, but quotations are maintained by the strength of coking sorts. Inquiry for gas makes for forward delivery is still slow. Wear specials are said to have been done for the whole of next year at 24s., and best qualities at 23s. 6d.; but the quantity and importance of the sales are not known. These figures may, however, be taken as representing the present ideas of collieries, with seconds and others 22s. 6d. to 23s.

At the time of writing, the decision of the Miners' Federation to ballot on the National Agreement, with every prospect of a vote to terminate it, has not yet been discussed on the market. While there will be three months available in which to come to new terms, the danger of a stoppage in the industry cannot be denied. Though it appears that the owners are willing to grant concessions on some of the miners' demands, the minimum wage question is likely to be a very great difficulty. There are some districts which could perhaps concede a higher minimum, and live; but there are others where economic conditions make it impossible. While it is greatly to be hoped that some settlement will be arrived at, there is every prospect that the danger may cause considerable demand for stocking purposes pending the appearance of some daylight on the situation.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From a Local Correspondent.

There is, as usual at this time of the year, a good demand for all quantities of house coal, and prices as a result remain firm. There is some delay in regard to delivery by reason of the railway companies being unable to cope with the traffic on their lines. Householders will, therefore, be well advised to order a week in advance.

There would appear to be a slight improvement in the industrial outlook, one or two indications coming from the Middlesbrough area that furnaces are being blown in. Whether this will be maintained is a matter for conjecture.

There is a scarcity of gas coal supplies purely owing to the season, and, in accordance with past conditions, collieries are being pressed for deliveries, and are responding accordingly. Stocks, however, are low.

The shipping outlook is not so bright; the political situation having created that degree of uncertainty which prevents the foreigner purchasing coals ahead. The rate of exchange also operates adversely, and at the same time the English contractor does not know whether it will be policy to buy or sell even for a short period. This is a matter that may be cleared up in a few weeks; but the present situation does not lend itself to commercial stability.

COAL TRADE IN THE MIDLANDS.

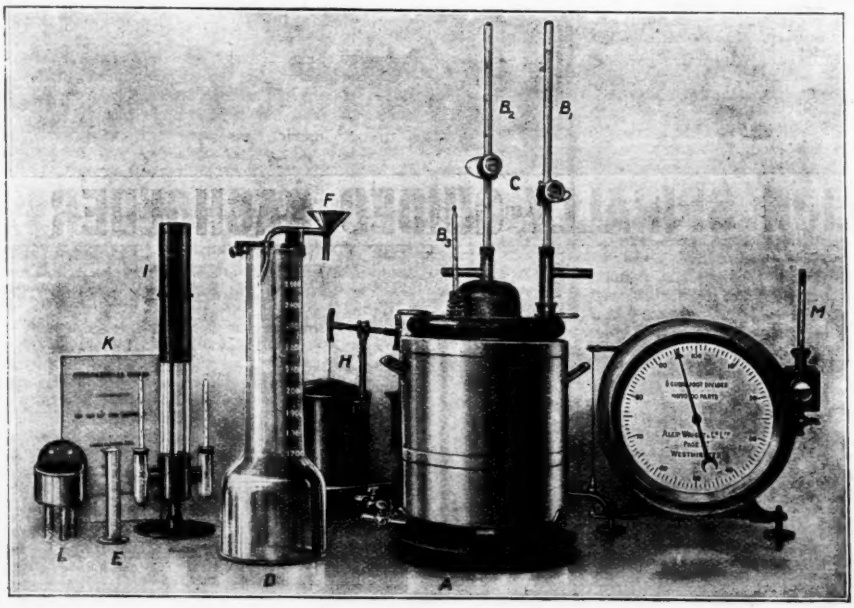
From our Local Correspondent.

The pits are making a steady output, and it is all readily absorbed. Occasional interruptions of production are reported as a result of the shortage of wagons. The available rolling stock is only reasonably sufficient for dealing with the current volume of trade even if traffic works smoothly. Some delays and breakdowns are inevitable, particularly at this season of the year, when unfavourable weather conditions have to be reckoned with, and there is a great deal of special Christmas traffic on the railways. With the best that can be done the coal trade is having a harassing time in getting supplies to the consumer. The activity in the house coal trade continues. Best qualities are wanted faster than they can be got. The stiffening of prices is provoking loud protests from consumers, who were urged months ago to assist the trade in mitigating mid-winter congestion, but who paid no heed though they were offered low prices as an inducement. Then collieries had not sufficient orders to keep them fully employed; now they are unable to cope with all the demands made upon them. There is the usual seasonal increase in the consumption of gas coal. The industrial load has tended to grow slowly, and prospects for the New Year are considered hopeful, though no marked expansion is expected. Gas coal which is uncontracted-for has appreciated; there being no freedom in the market.

With more furnace coke being called for at home, and some reinvigoration of export demand, the market has tightened up. Prices 1s. to 2s. above the 24s. basis at ovens which was laid down at the conference between representatives of the cokeries and the Midland blast-furnaces have been paid. Foundry coke is also showing susceptibility to tension.

Gas Explosion in Glasgow.—Some tenement houses in the Parkhead district of Glasgow were damaged by a gas explosion, which is stated to have occurred at a time when two plumbers in the employ of the gas department were engaged in uncovering a pipe outside the premises. A number of flagstones were dislodged, and several persons complained of being hurt.

BOYS CALORIMETER



GAS REGULATION ACT, 1920.

CALORIMETER

as prescribed

by

GAS REFEREES.

ALEXANDER WRIGHT & Co., Ltd.,

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WESTMINSTER, S.W. 1.

No. 588 "Arran" Fire.

By Appointment.

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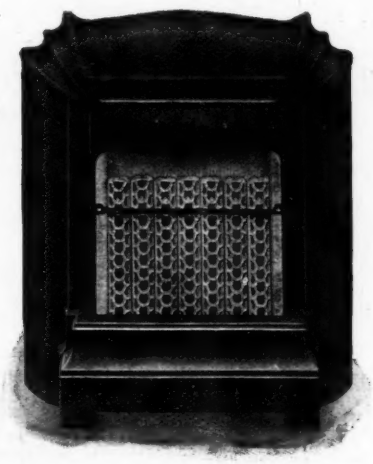

No. 583 "Cambuskenneth" Fire.

Revised Pensions and Co-Partnership Schemes at Ipswich.

To celebrate the revision of the co-partnership and superannuation funds (the former having been in existence for 10 years and the latter for 26 years), the Directors of the Ipswich Gas Light Company entertained their employees, numbering close upon 300, at supper on Monday evening of last week. Mr. Henry Woodall (Chairman and Managing-Director) presided, and was supported by Mr. Hugh Turner (Deputy-Chairman), and other Directors; Mr Frank Prentice (Engineer and Manager), and Mr. G. A. Mallett (Secretary). Mr. Hugh Turner, giving the toast of the Company, remarked that, though they might have had difficult times during the war, by the loyalty of the staff and workpeople they had made comparatively light of them. They had lately lost their Chairman (Sir Daniel Goddard), but they had in his place Mr. Henry Woodall, who probably knew more about gas company management than any other man in the country. Sir Daniel always had the wish to improve the position of the employees, and Mr. Woodall was anxious to follow in his footsteps. The Chairman, responding, expressed his pleasure at meeting them all, and said he recognized the responsibility of following Sir Daniel Goddard, who was an old friend of his, and, he believed, a friend to all of them. Under the revised co-partnership scheme, the employees would receive the same rate of bonus on their wages as the shareholders received as dividend on capital. It was expected that the figure would be nearly 6 p.ct. for the current year. Up to the present date, £6103 had been paid as bonus and interest, and 172 co-partners owned between them £4920 of the Company's stock. As to the superannuation fund, the Directors had decided to remodel the whole scheme, and make the pensions large enough to enable the employees to retire at 65 on something better than the means of mere existence. The Company agreed not only to contribute not less than the amount of the employees' contributions, but to guarantee the stability of the fund, and to bear all costs of administration. Mr. Prentice, proposing the health of the Chairman and Directors, said the interest that the Board took in the employees had been amply evidenced by these generous schemes of co-partnership and superannuation. On the proposition of Mr. Mallett, the artistes were thanked for their contributions to an extremely enjoyable evening.

Cheaper Gas at Birkenhead.—The Birkenhead Corporation Gas Committee have decided that, as from the December meter readings, the charges for gas shall be decreased. The price to consumers within the borough is to be reduced from 3s. 6d. to 3s. per 1000 c.ft., and to those outside the borough from 4s. to 3s. 6d. There are varying discounts for consumptions of a million c.ft. per annum and over. For power purposes, the prices will be lower than these.

Faulty Gas-Fitting Causes Death at Leamington.—An inquest was held at Leamington last week on the body of Asher Harris (aged 68), who was found dead in bed, with a strong smell of gas in the room. The gas-taps were turned off; but an employee of the Gas Company examined an old slide pendant with two arms of brazed tubing, and found one arm had split, allowing gas to escape at the rate of 18½ c.ft. an hour. Mr. R. S. Ramsden (General Manager and Engineer of the Company) explained that the fitting in question was one of the now less-used type. These pipes, as a result of external corrosion, were liable to split suddenly. Solid-drawn brass tubing, which removed such danger of leakage, was now being employed in preference to brazed pipes. The Company were frequently reminding their customers to have their fittings examined. Death was shown to have been due to the effects of coal gas on a weakened constitution. A verdict of "Accidental death" was recorded. In reply to a suggestion of the Jury that steps should be taken to eliminate the danger of leakages from gas-brackets, the Coroner pointed out that they had no power to prevent the use of such brackets.

The Plymouth Corporation last week authorized the issue of £250,000 of 4½ p.ct. stock, part of the proceeds of which will be devoted to gas-works purposes.

The Cape Town and District Gas Light and Coke Company announce an interim dividend of 6s. per share, less tax, on the ordinary shares.

Upon the invitation of the Insurance Institute of Ipswich and Suffolk, Mr. Charles E. Wright, of the Ipswich Gas Light Company, last Thursday delivered a lecture to the members on "Fire Risks in Gas-Works and Bye-Products Plant."

A butcher named Charles Walker, living at Notting Hill, was commended by the Coroner at an inquest at Hammersmith, for the gallant attempt he made to save the life of William Butt, a gasfitter, of Willesden, who was overcome while repairing a gas-meter.

At the Keighley Police Court last Thursday, there were 183 people summoned for non-payment of gas and gas-cooker rents. Eight debtors appeared, and letters were read from others. Various offers of payment were accepted. In most cases, unemployment was the defence put forward.

The Uckfield Board of Guardians have been discussing the improved lighting of the premises under their control. At present oil is used; and a proposition that this should be superseded by gas (as being less costly than electricity) has been referred back in order that specifications may be obtained for the installation of petrol gas, electricity, and gas.

The Farnborough Urban District Council own a piece of land at the junction of Alexandra and Reading Roads, upon which a shelter has been erected, and which (for reasons not known to us) is known locally as the "Birdcage." In reply to a question by the Aldershot Gas, Water, and District Lighting Company, the Works Committee said they would be prepared to recommend the Council to sell the land for £750, subject to their receiving the sanction of the Ministry of Health to part with it. The Company expressed their willingness to accept this offer, which is at the rate of £3000 an acre; but when the matter came before the Council there was a long discussion, at the end of which it was referred back to the Works Committee for the purpose of obtaining further information that certain members felt should be in their possession before coming to a final decision.

STOCK MARKET REPORT.

THE result of the General Election cast a gloom over the stock markets last week; and though a more hopeful tone prevailed on Tuesday, on a rumour of a possible agreement between the Conservatives and Liberals, it was speedily dissipated by the emphatic denials of both parties, and prices sagged in most markets. The announcement that American business experts would participate in the conferences to inquire into Germany's economic position acted as a slight tonic. Gilt-edged stocks, Home and Foreign Rails, Foreign Government Bonds, and Industrials all shared in the general depression; and although there were many buyers, the majority were bargain hunters. The opposition of the Labour Party to the possible sale of the country's holdings in the Anglo-Persian Oil Company failed to assist the Oil Share Market, which was particularly uninteresting. The news from the provincial exchanges reflects the position on the London Exchange, and, with perhaps a few exceptions in local issues, there was a lower tendency all round.

The Gas Market was no exception to the general rule; and the changes in the quotations, which were a little more numerous than usual, were on the down grade. Alliance and Dublin fell 5 points, to 62-67; Bombay dropped ⅛, to 5-5½; Brentford 4 p.ct. debenture 1, to 76-81 *ex* div.; Commercial 3 p.ct. debenture 1½, to 59-62 *ex* div.; Continental Union 7 p.ct. preference 5, to 80 85 *ex* div.; Gas Light and Coke ordinary dropped 1, to 92-94, 3½ p.ct. maximum 1, to 64-67, 4 p.ct. preference 3, to 75-78, 3 p.ct. debenture 2½, to 59-62; Imperial Continental 3½ p.ct. debenture ½ to 75½-77½; Malta and Mediterranean ⅛, to 3⅝-3⅞ *ex* div.; Primitiva 5 p.ct. preference 1/16, to 1⅛-1⅜; South Metropolitan ordinary fell 1, to 95-97, 6½ p.ct. debenture 1, to 105 107; South Suburban ordinary 1, to 99-102; and Tottenham 4 p.ct. debenture 1, to 77 81 *ex* div.

The following transactions were recorded during the week: On Monday, Cape Town 4½ p.ct. debenture 77, 78, Commercial 3 p.ct. debenture 61, 61½, European 7¾, 7⅞, Gas Light and Coke 92½, 93, 93½, 94, 94½, 3½ p.ct. maximum 65½, 4 p.ct. preference 79½, 3 p.ct. debenture 62, Liverpool 7 p.ct. preference 106½, Montevideo 50½ *ex* div., Ottoman 20s., 22s. 6d., Primitiva 5s., 6s., South Suburban 100½, 5 p.ct. debenture 99, 100. Supplementary prices, Danish 6½. On Tuesday, Bombay 5 1/16, Brentford "A" 102⅝, 103, Croydon 103. European 7¾, Gas Light and Coke 92½, 92⅝, 92⅞, 92⅞, 92 15/16, 93, Imperial Continental 145½, South Metropolitan 96½, South Suburban 5 p.ct. 100, 101. On Wednesday, Bombay 5 1/16, Brentford "B" 102½, 4 p.ct. debenture 78, Commercial 4 p.ct. 96½, Croydon sliding-scale 104, European 7¾, Gas Light and Coke 92, 92½, 92⅝, 92⅞, 93, 93½, 3½ p.ct. maximum 64½, 4 p.ct. preference 79½, Imperial Continental 144, 3½ p.ct. debenture 76½, Oriental 101 7/16 *ex* div., Primitiva 6s., 4 p.ct. debentures 73¼, 73½ *ex* div., San Paulo 6 p.ct. preference 5⅝, 5 p.ct. debentures 40, South Suburban 5 p.ct. 100¾, 101, Swansea 6½ p.ct. debenture 105⅝, 105½, Wandsworth "A" 141, 141½, "B" 118, 118½, 3 p.ct. debenture 58¾, 59. Supplementary prices, Danish 5 p.ct. preference 6½, 6 15/16, Guildford 91, 91½. On Thursday, Alliance and Dublin 64⅜, Bombay 5½, Croydon sliding-scale 103½, 104, 104¼, 104½, Gas Light and Coke 92½, 92⅝, 92⅞, 93, 4 p.ct. preference 78½, Primitiva 5 p.ct. preference 23s., San Paulo 6 p.ct. preference 5⅞, 5 p.ct. debenture 41, South Metropolitan 95¾, 96, 96¼. Supplementary prices, British 3½ p.ct. debentures 64½. On Friday, Alliance and Dublin 63, Bombay 5 1/16, Brentford "B" 102, 102½, Continental Union 7 p.ct. preference 80 *ex* div., European 8, Gas Light and Coke 92, 92½, 92¼, 92½, 92¾, 4 p.ct. preference 75, 75¼, 3 p.ct. debentures 59 *ex* div., Liverpool 7 p.ct. preference 106¾, Primitiva 5s., 5 p.ct. preference 22s., 4 p.ct. (River Plate) debenture 56, South Metropolitan 95, 96, 3 p.ct. debenture 62¾, 63 p.ct. debenture 105, South Suburban 5 p.ct. ordinary 99½.

For the most part the foreign exchanges presented a steady appearance, and the fluctuations were confined within very narrow limits. The dollar sterling closed on Friday at $4.36⅜, as compared with $4.35 the previous week. The French rate was 70 centimes weaker at 82.00, and the Belgian receded 40 centimes to 94.80.

Credit supplies in Lombard Street have been extremely plentiful, which was accounted for by the absence of any demand for money for financing new trade ventures. Moreover, funds disbursed at the beginning of the month are not, as is usual, being invested in securities. At the close of the week old loans were effected at 2¼ and 2 p.ct., but fresh advances could be had down to 1½ p.ct., and even a lower rate.

Silver closed at 33⅝d. per oz, which is a slight advance on the price last week.

The Bank rate is 4 p.ct., to which it was raised from 3 p.ct. on July 5. Bankers' deposit rates are 2 p.ct. The deposit rates of the discount houses are 2 p.ct. at call and 2¼ p.ct. at notice.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S TRANSACTIONS.

Issue.	Share.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Divid. at Rate of	NAME.	Closing Prices, July 30, 1914.	Variation. Quotations, Dec. 14.	Variation. Lowest and Highest Prices of Transactions.
£			p.c.	% p.a.				
131,978	Stk.	Aug. 9	—	5	Aldershot 5 p.c. max. C.	..	72—77	...
217,992	,,	,,	4	4	Do. 4 p.c. Pref.	..	70—75	...
1,551,868	,,	Oct. 4	2½	5½	Alliance & Dublin Ord.	59—64	62—67	63—64⅜
374,000	,,	July 12	4	4	Do. 4 p.c. Deb.	76—79	62—67	...
280,000	5	Oct. 18	7½	8	Bombay, Ltd.	5⅜—6⅜	5—5⅜	5 1/16—5 5/16
100,000	10	Aug. 9	16	8½	Bourne-mouth Gas and Water { 5 p.c.	..	12½—13½	...
983,110	10	,,	7	7	Bourne-mouth Gas and Water { B 7 p.c.	13—15½	11½—12½	...
115,000	10	,,	6	6	Bourne-mouth Gas and Water { Pref. 6 p.c.	13½—14	11—12	...
162,025	—	June 28	—	4	Bourne-mouth Gas and Water { 4 p.c. Deb.	..	77—82	...
992,045	Stk.	July 12	14	6 3/10	Brentford A Consolid.	261—266	100—105	102½—103
734,920	,,	,,	11	6½	Do. B New	204—209	100—105	102½—102½
55,000	,,	,,	5	5	Do. 5 p.c. Pref.	109—111	90—95	...
221,400	,,	Dec. 13	4	4	Do. 4 p.c. Deb.	91—93	76—81*	78
214,745	,,	Aug. 23	11	11½	Brighton & Hove Orig.	208—213	175—180	...
244,200	,,	,,	8	8½	Do. A Ord. Stk.	154—159	127—132	...
1,287,500	Stk.	July 26	5	5	Bristol 5 p.c. max.	..	95—96*a*	...
570,000	20	Oct. 4	12½	12	British A Ord.	44—45	122—127	...
100,000	10	June 28	—	7	Do. 7 p.c. Pref.	..	122—127	...
120,000	Stk.	,,	4	4	Do. 4 p.c. Deb. Stk	88—90	75—80	...
100,000	10	May 17	—	7	Cape Town & Dis., Ltd.	1½—2½	7—8	...
100,000	10	Oct. 31	—	4½	Do. 4½ p.c. Pref.	4—6	6—7	...
150,000	Stk.	June 28	4½	4½	Do. 4½ p.c. Deb. Stk.	70—75	75—80	77—78
237,860	,,	,,	—	7½	Cardiff 7½ p.c. Deb.	..	108—113	...
157,150	,,	Aug. 9	5	5	Chester 5 p.c. Ord.	108—110	85—90*b*	...
1,513,280	,,	July 26	5/9/4	6	Commercial 4 p.c. Stk.	106—108	95—98	96½
560,000	,,	,,	5½	6	Do. 3½ p.c. do.	103—105	95—98	...
475,000	,,	Dec. 13	3	3	Do. 3 p.c. Deb. Stk.	69½—71½	59—62*	61—61½
800,000	,,	14 Jan. 15	4	—	Continental Union, Ltd.	76—79	32—37	...
200,000	,,	Dec. 13	7	7	Do. 7 p.c. Pref.	115—118	80—85*	80
200,000	,,	Aug. 9	—	6½	Croydon sliding scale.	..	102—105	103—104½
284,975		,,	—	5	Do. max. div.	..	85—88	...
492,270	Stk.	,,	6	4½	Derby Con. Stk.	123—125	107—110*c*	...
55,000	,,	,,	4	4	Do. Deb. Stk.	102—104	74—76*c*	...
209,000	,,	,,	—	5	East Hull 5 p.c. max.	..	..	...
1,002,180	10	July 12	10	5	European, Ltd.	17½—18	7½—8½	7½—8
16,346,120	Stk.	July 26	4/17/4	5½	Gas { 4 p.c. Ord	98—102	92—94	92—94½
2,600,000	,,	,,	3½	3½	Gas { 3½ p.c. max.	76—79	64—67	64½—65½
4,062,235	,,	,,	4	4	Light and Coke { 4 p.c. Con. Pref.	96—99	75—78	75—79½
4,761,930	,,	Dec. 13	3	3	Light and Coke { 3 p.c. Con. Deb.	72½—74½	59—62*	59—62
130,000	,,	Dec. 11	10	10	Light and Coke { 10 p.c. Bonds	..	..	...
42,000	—	—	—	7½	Light and Coke { 7½ p.c. Ilford Deb.	..	..	...
82,500	,,	Sept. 19	5	6⅔	Hastings & St. L. 5 p.c.	..	93—98	...
258,740	,,	,,	3½	5½	Do. 3½ p.c.	87—89	78—83	...
70,000	10	Oct. 18	11	10	Hongkong & China, Ltd.	16½—16¾	16—17	...
86,600	Stk.	Aug. 23	9	9½	Hornsey 7 p.c.	..	144—149	...
1,976,000	,,	Nov. 15	9	5	Imperial Continental	150—160	143—148	144—145½
401,400	,,	Aug. 9	3½	3½	Do. 3½ p.c. Deb. Red.	84—86	75½—77½	76½
235,242	,,	,,	6½	6½	Lea Bridge Ord. 5 p.c.	119—121	95—100	...
2,127,240	,,	Aug. 23	10	5½	Liverpool 5 p.c. Ord.	...	90—91*b*	90
600,000	,,	Sept. 19	—	7	,, 7 p.c. Pref.	..	104—107*b*	106½—106½
165,736	,,	Aug. 23	7/5/6	9	Maidstone 5 p.c.	...	125—130	...
63,480	,,	June 28	—	—	Do. 3 p.c. Deb	..	53—60	...
75,000	5	Dec. 13	6	5	Malta & Mediterranean Met. of Melbourne { 4½ p.c. Deb.	4½—4¾	3½—3¾*	...
50,000	100	Oct. 1	4½	4½	Montevideo, Ltd.	99—101	95—98	...
341,920	Stk.	Nov. 29	4	4	Newcastle & Gatsh'dCon.	11½—12	48—53	50½
1,875,892	,,	July 26	4½	4½	Do. 4 p.c. Pref. Stk.	98½—99½	86—87*d*	...
250,166	,,	Aug. 9	—	4	Do. 3½ p.c. Deb.	..	74½—76½*d*	...
329,705	,,	June 28	3½	3½	North Middlesex 10 p.c.	82—83	73—74*d*	...
15,000	10	Aug. 23	—	11	,, ,, 7 p.c.	..	16½—17½	...
75,940	10	,,	7/14/0	7 7/10	Oriental, Ltd.	14—15	11½—12½	...
300,000	Stk.	Nov. 29	8	9	Plym'th & Stonh'se 5 p.c.	117—122	97—102	101 3/16
138,120	Stk.	June 28	—	7½	Portsea Island, B	..	108—113	...
60,000	50	Sept. 6	13	13	Do. C	128—131	105—110	...
100,000	50		12	12	Primitiva Ord.	118—121	100—105	...
1,450,345	5	29 Oct. 14	8	—	Do. 5 p.c. Pref.	5½—6	½—½	5/—6/-
2,199,800	5	30 Dec. 15	5	—	Do. 4 p.c. Deb.	4¼—5	1½—1¾	22/—23/-
341,400	100	Dec. 3	4	4	Do. ,, ,, 1911	91—93	70—75	73½—73½
600,000	Stk.	July 26	4	4	Do. B. Aires 4 p.c. Deb.	...	55—58	...
220,335	,,	June 28	4	4	Do. Riv. Pl. 4 p.c. Deb.	85—87	56—59	...
321,670	,,	,,	4	4	San Paulo { 6 p.c. Pref.	85—87	56—59	56
150,000	10	Oct. 4	6	6	San Paulo { 5 p.c. Deb.	10½—11	5½—6	5⅞—5⅞
125,000	50	July 2	5	5	Sheffield A	47—49	38—41	40—41
270,000	Stk.	Aug. 23	10	5	Do. B	223—224	100—102*e*	...
419,968	,,	,,	10	5	Do. C	222—224	100—102*e*	...
1,047,000	,,	,,	10	5	Do. Treasury 5 p.c.	220—223	100—102*e*	...
133,201	Stk.	—	4	6	South African	...	..	...
90,000	10	Oct. 18	9	6	South Met. Ord.	10½—11½	7—9	...
5,509,895	Stk.	July 26	5/9/4	5	Do. Red. Pref.	111—113	95—97	95—96½
250,000	,,	July 12	—	5	Do. 3 p.c. Deb.	..	98—100	...
1,895,445	,,	,,	3	3	Do. 6½ p.c. Deb.	72½—74½	61—64	62½
734,000	,,	Sept. 6	—	6½	South Shields Con. Stk.	..	105—107	105
91,500	,,	Aug. 23	8½	8½	S'th Suburb'n Ord. 5 p.c.	157—159	134—136*d*	...
1,087,795	,,	,,	6	6	Do. 5 p.c. Deb. Stk.	114—116	99—102	99½—101
368,837	,,	June 28	5	5	S'th'mpt'n Ord. 5p.c. max	116—118	97—102	99—100
647,740	,,	Nov. 15	5	5	Do. 4 p.c. Deb. Stk.	99—102	86—89	...
121,275	,,	June 28	4	4	Swansea 7 p.c. Pref. Stk.	..	76—81	...
250,000	,,	Aug. 23	—	7	Do. 6½ p.c. Deb. Stk.	..	102—104	...
200,000	,,	June 28	—	6½	Tottenham { A 5 p.c.	..	105—107	105½—105½
120,000	,,	July 26	—	8	Tottenham { B 3½ p.c.	135—138	122—127	...
782,275	,,	,,	6	6½	District { 4 p.c. Deb.	115—117	100—105	...
181,255	,,	Dec. 13	4	4	Tynemouth 5 p.c. max.	87—89	77—81*	...
258,251	Stk.	Aug. 23	5	5	Wandsworth, Wimbledon, and Epsom—	108½—109	89—91*d*	...
30,000	,,	July 12	8½	9	Wandsworth A 5 p.c.	151—156	140—145	141—141½
255,636	,,	,,	6½	7½	Do. B 3½ p.c.	129—134	116—121	118—118½
108,075	,,	,,	5/17/3	6 3/10	Do. C.	110—115	100—105	...
140,865	,,	,,	—	6 3/10	New Ordinary	..	..	...
352,000	,,	,,	6½	7½	Wimbledon 5 p.c.	117—122	110—115	...
98,000	,,	,,	6½	7½	Epsom 5 p.c.	121—126	118—123	...
88,416	,,	June 28	3	3	5 p.c Deb. Stk.	66—69	57—60	58½—59

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